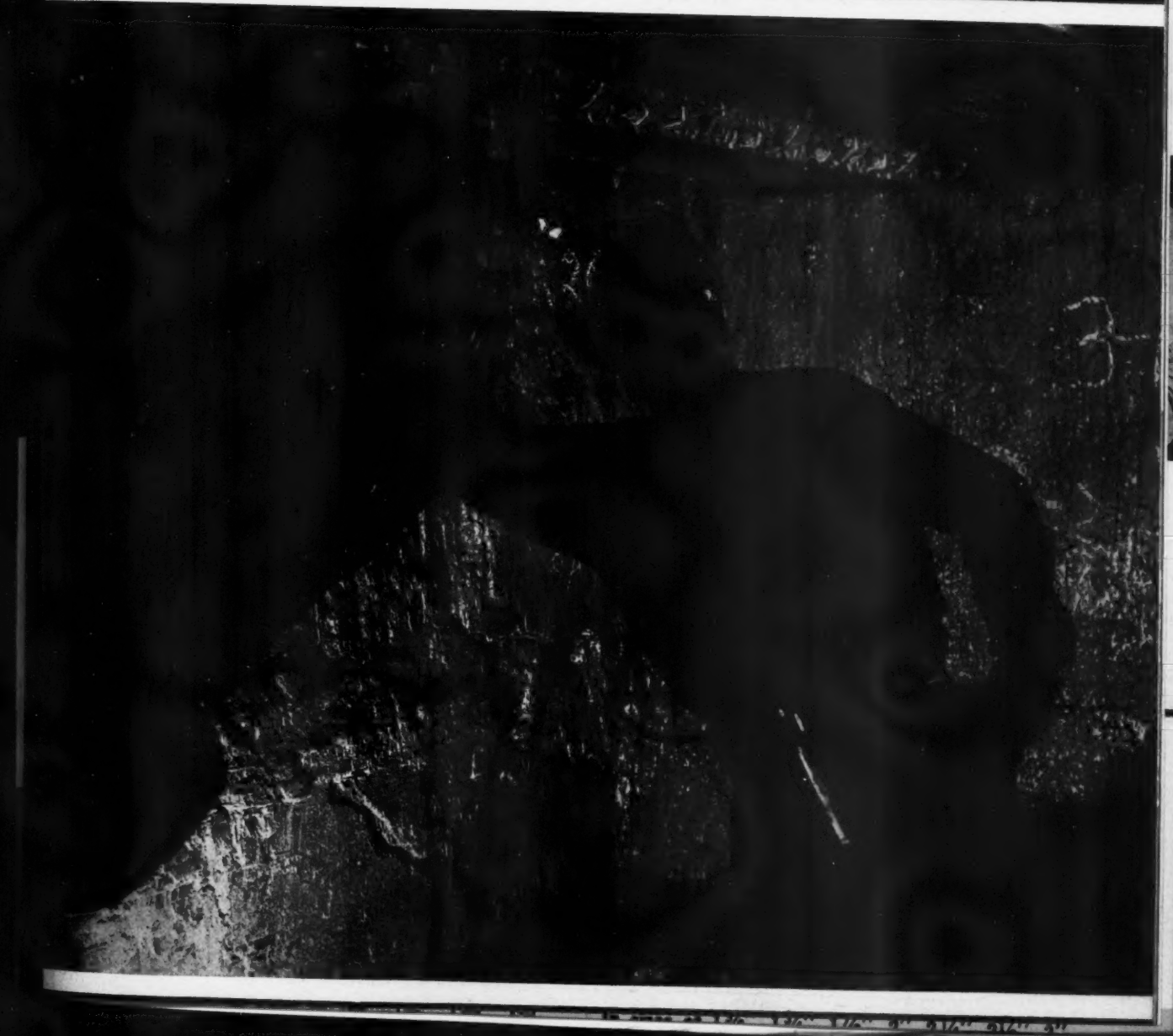
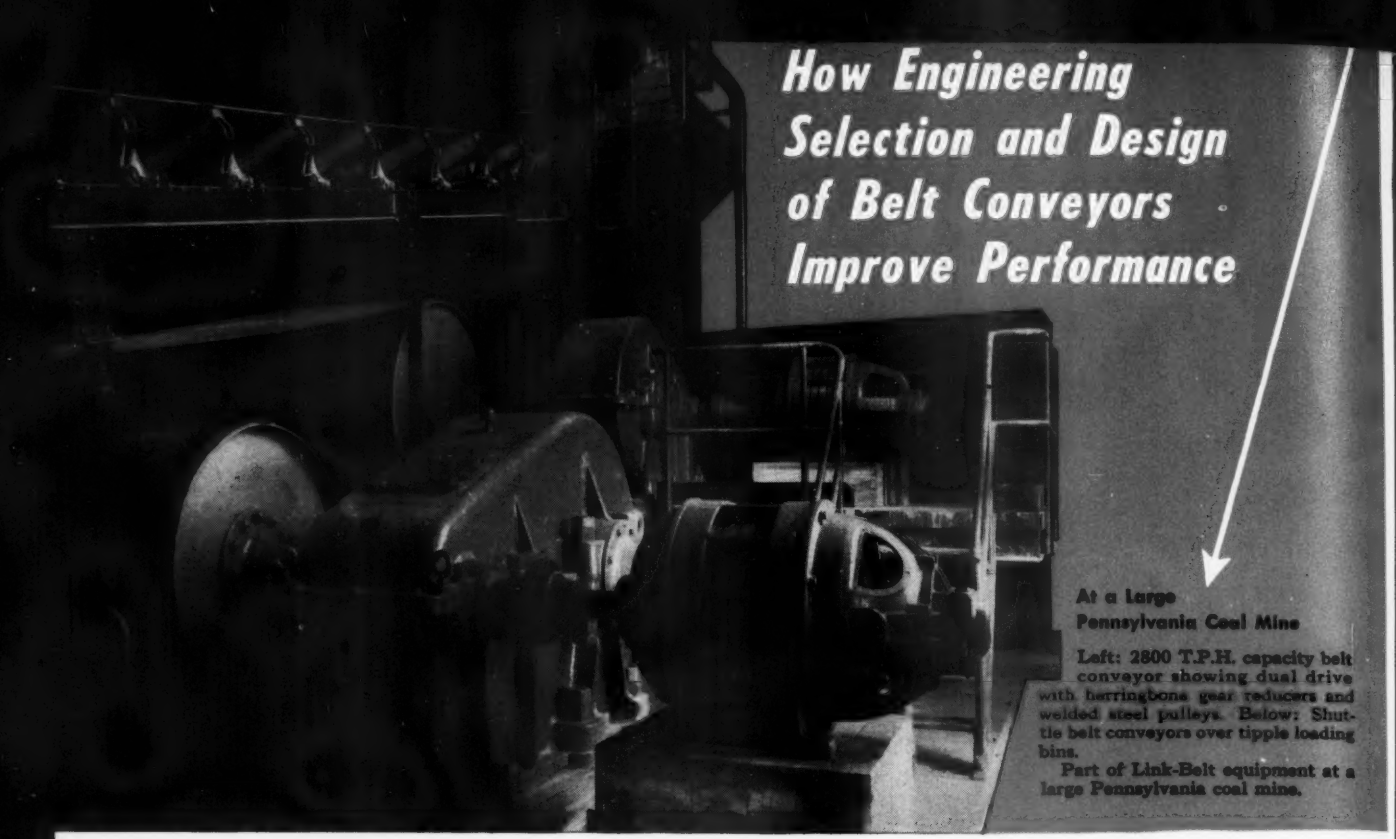
Mining CONGRESS JOURNAL





How Engineering Selection and Design of Belt Conveyors Improve Performance

At a Large Pennsylvania Coal Mine

Left: 2800 T.P.H. capacity belt conveyor showing dual drive with herringbone gear reducers and welded steel pulleys. Below: Shuttle belt conveyors over tipple loading bins.

Part of Link-Belt equipment at a large Pennsylvania coal mine.

THE success of Link-Belt belt conveyor installations in raising production rates and cutting handling costs, with a minimum of maintenance, is due not only to the most advanced design and construction of Link-Belt carrying and return idlers, but also to:

- properly designed terminal drive machinery.
- efficient discharge chutes at terminal and discharge points.
- a design of welded steel pulleys that reduces shaft deflection.
- highest mechanical efficiency in speed reducers, direct coupled or chain driven.
- engineering experience to produce the proper relationship between pulley diameter and ply thickness of belt; also between size of material handled and conveyor belt width, quality of rubber covering, carcass specifications. etc.

The user gets the benefit of this experience when he selects Link-Belt belt conveyor equipment — idlers, trippers, drives, pulleys, bearings, takeups, belts.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 19, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8. 10.E51

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Mining CONGRESS JOURNAL

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FRONT COVER: Top cutting into the Pittsburgh seam at the Leisenring No. 2 Mine of U. S. Steel's H. C. Frick Coke Co., near Uniontown, Pa.

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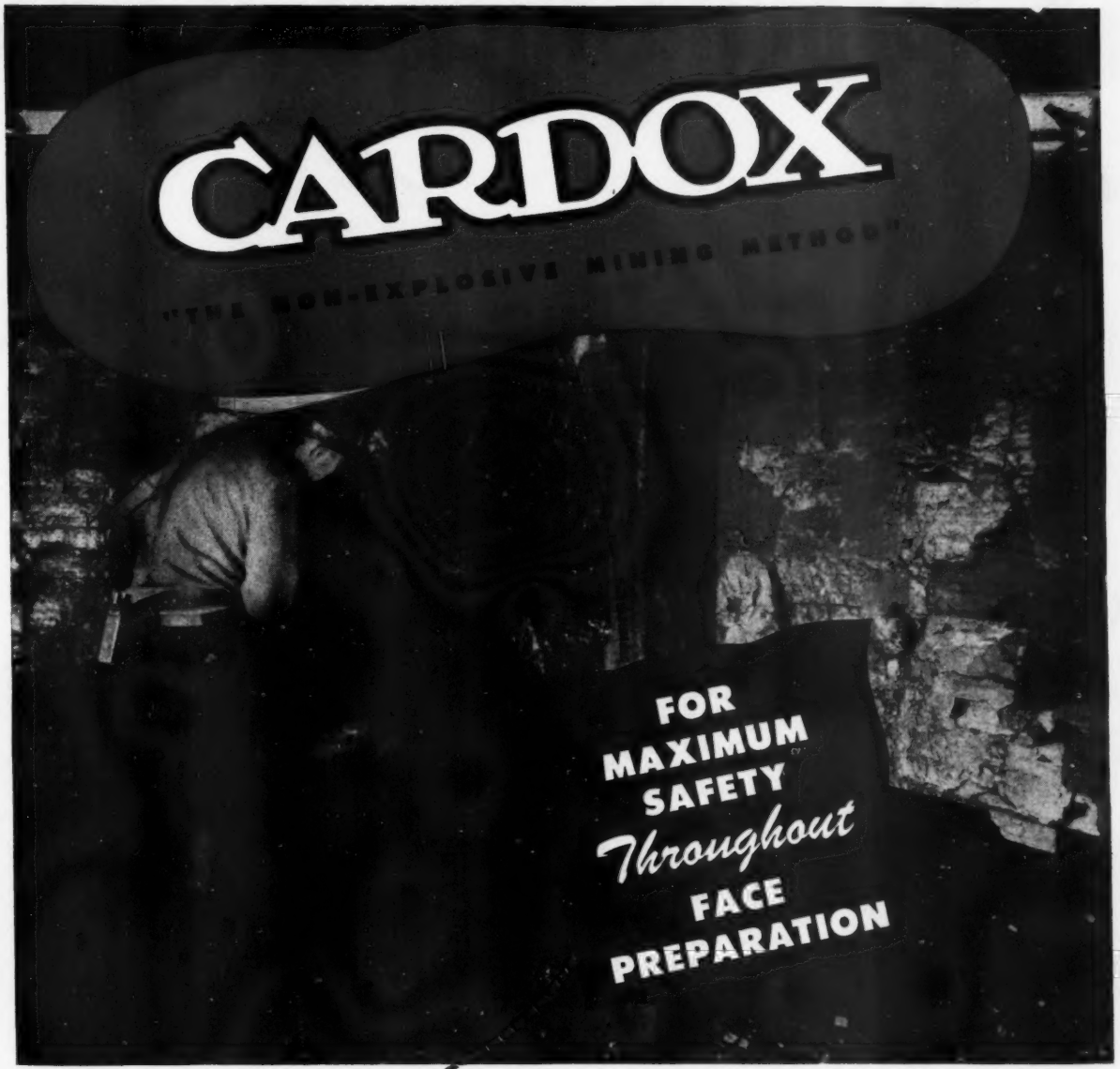

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Kennametal cutting machine bits are your best performers in coal, sulfur, rock, etc., in the top cut, shear, or in the bottom. Their hard wear-resistant cutting edges enable them to last longer, take hard shock, and reduce bit cost per ton.

Mining machines can operate easier, at less load, more uniform power consumption, and there's less maintenance on chains and machines. Cuttings are larger, advance rates faster.

With Kennametal cutting machine bits the miner spends less time changing or resetting. His time is utilized for production, not wasted in costly shut-downs, hauling, handling, and sharpening.

For complete details write for catalog M-4 today.

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Kennametal percussion bits drill hard rock at phenomenal speeds, far faster than any other metal ever used in percussion drilling. Hole after hole can be drilled full depth with the same bit. There is little gage loss even after a hundred or more feet has been drilled in such hard rock as hard silica sand, hard limestone, etc. The fact that holes do not taper assures maximum contact of charge, better detonation, and minimizes the amount of rock dust.

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The bits drill at from two to nine times as fast as steel to reduce the number of man hours for percussion drilling . . . the labor cost is lower, the bits last longer, and cost less to use.

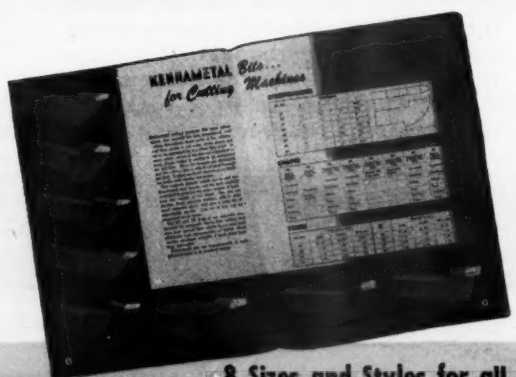
For more complete details write for catalog M-4 today.

Send for a copy of the NEW Kennametal Mining Tool Catalog Today!

NEW!

The new Kennametal Mining Catalog M-4 provides you with a wealth of helpful information on cutting, drilling, augers, sockets, prices, and recommendations for auger and bit sizes to be used together.

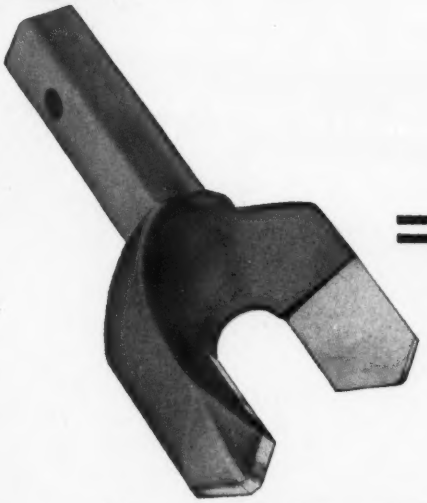
Get your request in the mail today, we'll be glad to send you our new, complete catalog . . . a new edition that may mean more profits in the mine you operate or supervise.



In the race for coal mining economy, modernization . . . Kennametal cutting machine bits come near the top bracket as a starting point for increasing efficiency, improving work at the face . . . right where high production originates.

8 Sizes and Styles for all popular chains

you higher profits . . .



=Lower Mining Costs

Kennametal Drill Bits

Kennametal drill bits for post, mounted or push drills help you step up production at the face, balance operations. Their hard Kennametal cutting edges have a high compressive strength that enables the bit to take the hard jolts of high speed drilling in coal, rock, slate, clay, etc. Kennametal has the inherent characteristic to resist wear and abrasion . . . to stay sharp longer under constant use, and it allows the drill to operate free, without binding, sticking, or slowing down at high drilling speeds.

The bits greatly reduce the burden on the drill by eliminating the usual load near the end of the hole that is caused by dull bits. In post or mounted drilling, the number of armature burnouts are less and the maintenance cost is lower. In push drilling specially designed cutting edges take hold quickly, feed properly, and relieve much of the burden of manual drilling.

Kennametal bits retain their gage far longer than hard surfaced steel, and they assure better, more effective detonation by providing a straight, uniform hole. The bit cost is lower, less time is required for drilling blast holes, and fewer bits need to be sharpened, and transported.

For complete details write for catalog M-4.

KENNAMETAL

MINING DIVISION
•
KENNAMETAL *Inc.*
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Latrobe, Pa.

Send for a copy of the NEW Kennametal Mining Tool Catalog Today!

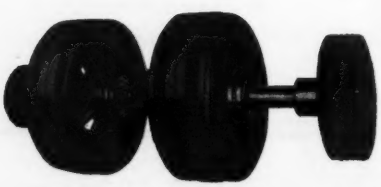
Drill bits and percussion bits go hand in hand with faster, more economical work in the section. Drill bits bring you faster blast hole work . . . complement fast cutting. The percussion bit speeds the way in rock work in the section, entry, or overcast.

In sizes of 1 3/4" 1 1/4" 1 5/8" 1 3/4" In sizes of 1 5/8" 1 3/4" 1 7/8" 2" 2 1/4" 2 1/4" 2"

look to...

P&H

for added values



The New P&H Magnetorque Swing

Power for swing and propel transmitted by electro-magnetic forces. Operated by small generator on main engine; controlled from operator's station. Swing motions, slow or fast, have cushioned acceleration and deceleration. Because there is no friction swing, there are no friction problems. One more in the long list of P&H Added Values.

Wherever you find the P&H Model 1055 on the job, you'll hear owners singing its praises for the new Magnetorque swing which marks the end of swing friction trouble and costly maintenance.

No Friction . . . No Friction Problems

The new Magnetorque solves the problems of old style swing clutches . . . by completely eliminating friction.

Without mechanical linkage . . . without friction . . . without wear — the Magnetorque transmits power for both swing and propel motions — and does it better.

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Because it's smoother, faster, more responsive . . . because it permits quicker, more accurate stops and starts — the Magnetorque swing cuts wasted operating time, increases daily production and lowers yardage costs.

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The Magnetorque is built to last the life of the machine. And during this time not so much as a single hour will be required for its repair, replacement, or maintenance.

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THIS DRIFTER DOES MORE OF THE WORK

The New Blue Brute WPMS Drifter has the advantage of mechanical cranking. The light, shell-mounted Worthington Pneu-Motor is easily adjustable for proper feeding — to hold the machine to the rock and take up all the slack — without ever crowding the rotation.

Like the other new Blue Brute Drifters — WPM (Pneu-Motor on Drifter) and WHC (Hand Crank) — the WPMS comes in 3″, 3½″ and 4″ cylinder sizes, *with mountings standardized to take all three sizes.*

Like them, too, it will short-stroke under heavy loads, reducing stuck steels to a minimum. And its one-piece chuck sleeve lessens friction, holds the drill in better alignment and allows the piston to hit cleaner and harder.

HIGH EFFICIENCY AT LOW COST

Fast, vibration-free drillers, easy and economical to operate, these ultra-modern Drifters are giving daily proof that *there's more worth in a Blue Brute* . . . Write for literature describing the complete line of Blue Brute Mining Equipment.

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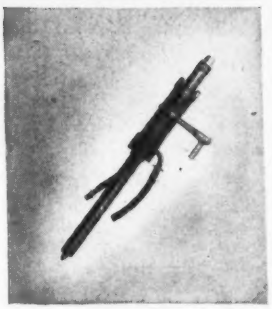


BLUE BRUTE STOPER

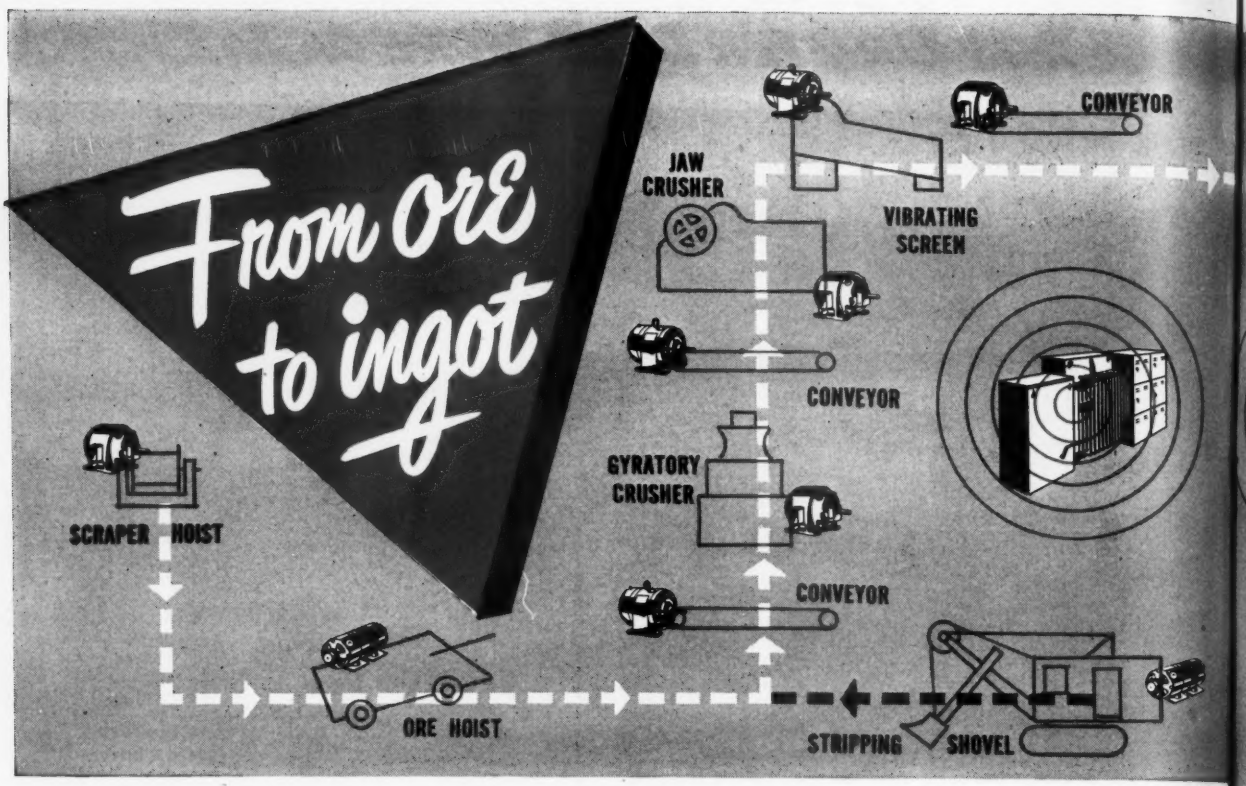
Self-Rotating Model WR-31 is well balanced, easily handled and has many other features that make it a favorite with mining men. Fully described in Bulletin H-1200-B30.

BUY BLUE BRUTES

Semi-Portable Compressors. Drifters with Feed Motor Incorporated. Drifters with Feed Motor on Shell. Hand-Crank Drifters. Stopers. Hand-Held Rock Drills.

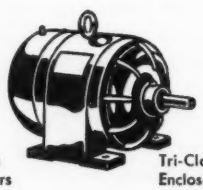
WORTHINGTON

Worthington Pump and Machinery Corporation. Worthington-Ransome Construction Equipment Division Holyoke, Mass.

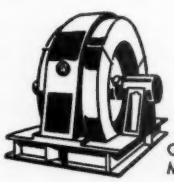


G-E MOTORS AND CONTROL

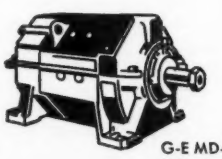
Tri-Clad Open Dripproof Motors



Tri-Clad Totally Enclosed Motors



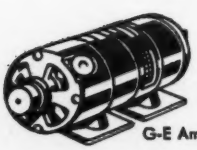
G-E Synchronous Motors



G-E MD-600 Armored Mill Motors

G-E MOTORS can be applied to almost every process used in copper mining, concentrating, and smelting. For average drive requirements, there are G-E Tri-Clad open dripproof motors; for extra-dusty or extra-wet applications, G-E Tri-Clad totally enclosed motors; for drives where better power-factor is essential, G-E synchronous motors; and for heavy-duty applications, G-E armored mill motors. All types feature greater physical strength, electrical balance, and operating stamina.

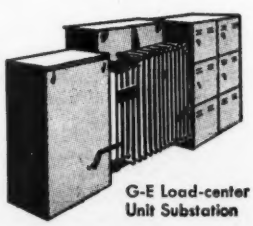
G-E CONTROLS and power distribution equipment are available for every standard and specialized requirement of your plant. For a control device that makes possible high operating speeds on mine hoists and stripping shovels, there is the G-E Amplidyne; for "packaged" low-voltage motor control, G-E Cabinetrol; for protective high-voltage motor control, G-E Limitamp control; and for modern power distribution, G-E load-center unit substations.



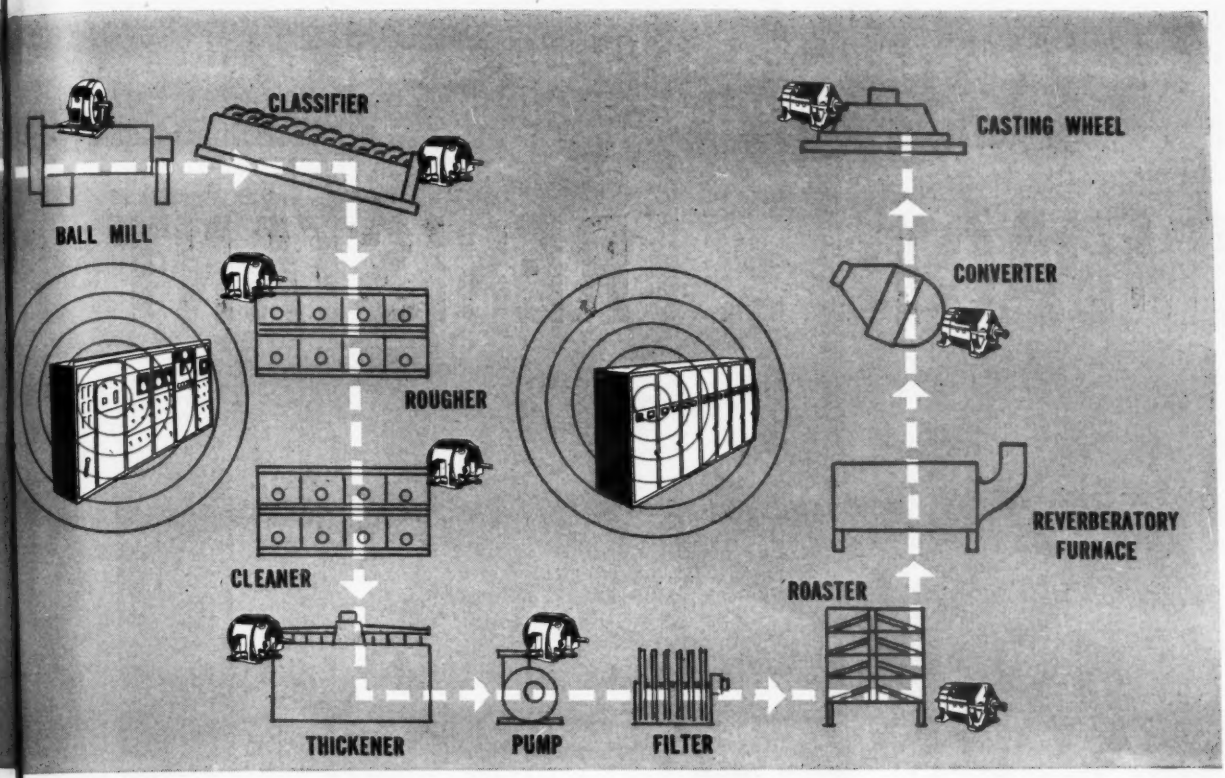
G-E Amplidyne

G-E Limitamp Control

G-E Cabinetrol



G-E Load-center Unit Substation



HELP KEEP COSTS DOWN!

TODAY, more and more copper mining companies are examining their operation flow charts with this vital objective in mind—to offset rising labor and material costs. They know that the application of electric motors and control is the most economical and most efficient means to obtain this objective.

For one thing, electrification with General Electric motors and controls gives you the advantages of *automatic* operation. You eliminate countless manual steps—make better use of your available manpower. General Electric controls also give you precise regulation of ore processing and help to reduce wasted effort and materials. Finally, General Electric motors and controls are dependable, stay on the job for years with only a minimum amount of maintenance.

As manufacturers of every type of electrical equipment for copper mines and processing plants, General Electric can assist you in any electrification program, large or small. *Apparatus Dept., General Electric, Schenectady 5, N. Y.*

MOTORS AND CONTROL
for the
copper industry

GENERAL ELECTRIC

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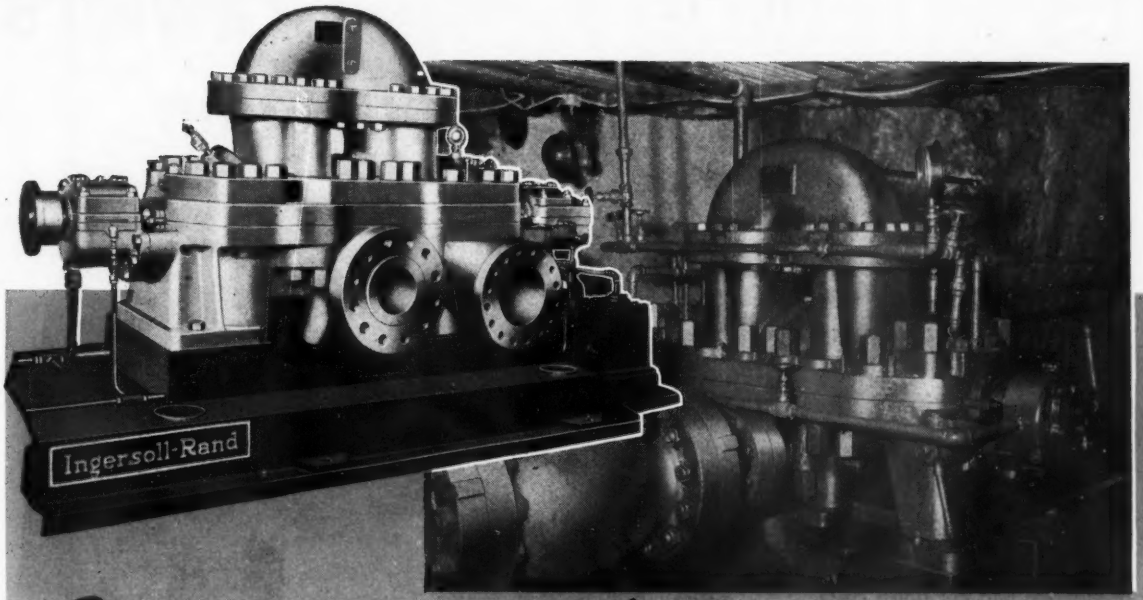
U. S. Rubber Company scientists, using special testing equipment, have a "field day" when they go to work on U. S. Royal Electrical Cables. In the impact test, for example, U. S. Royal Cables are hammered in the same spot over and over again. Ability to withstand this ordeal means U. S. Royal Cables have *proven* impact resistance.

U. S. Royal Cables are also put through a Chamber of Horrors where they are twisted, stretched, heated, bent, frozen and soaked in water.

After passing these tests, U. S. Royal Cables fully deserve their "Safety-Tested" labels...They are able to stand up under the toughest operating conditions. Resistance to oil and gas is provided by a Neoprene jacket. For further information address United States Rubber Co., Wire and Cable Dept., 1230 Avenue of the Americas, New York 20, N. Y.

THE NEW U. S. ROYAL *Safety Tested*

MINING MACHINE AND LOCOMOTIVE CABLES



Making water flow up-hill

Yes, water has to flow up-hill to drain a mine. It is the job of Ingersoll-Rand mine pumps to push this water to the surface—it's a tough job, too. The water is often highly corrosive and erosive, and the distance to the surface may be thousands of feet. Class RT station pumps have been eminently successful in many mines. Here are a few of the reasons.

- *Materials selected by the I-R metallurgical department resist the action of corrosive and erosive waters.*
- *Careful impeller design and large, smooth liquid passages result in high efficiencies that keep power costs down.*
- *Large oil-lubricated bearings keep the unit running smoothly hour after hour and month after month.*

These and many other features make Class RT pumps ideal for mine service. An I-R engineer will be glad to tell you about them. Remind him also to give you a copy of our mine pump bulletin, Form 7071. Ingersoll-Rand Company, Cameron Pump Division, New York 4, N. Y.

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CONDENSERS
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The Picture of INTERNATIONAL POWER in the Mines of America is one of lowered costs through matchless Operating Economy

Whether it's gold in Alaska, kaolin in Georgia, coal in West Virginia—or pay of any kind in any state—the bulldogged lugging ability of International Diesel Crawlers helps boost production and cut down costs.

Give an International your jobs of building access roads, removing overburden, cleaning up the workings, moving ore and doing anything else that a crawler can do. It will prove itself dependable and versatile. It's built to take on tough jobs and get them done . . . at unusually low cost.

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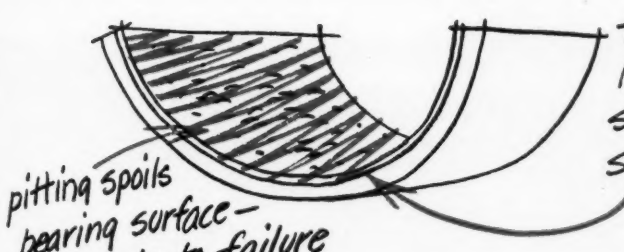
INTERNATIONAL *POWER*

CRAWLER AND WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

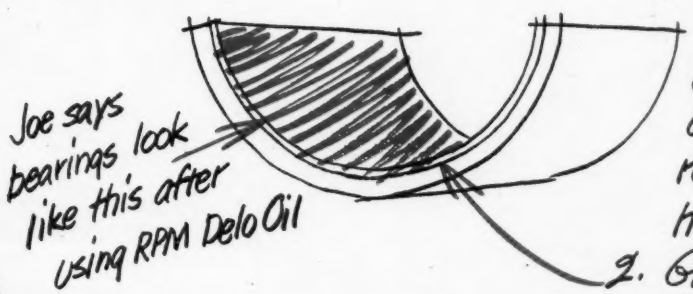
LUBE MEMO

Why it's smart to avoid "metal eating" lube oils



pitting spoils bearing surface — leads to failure

Heat and air in Diesels make many oils corrosive so they "eat" lead from structure of alloy bearings



Joe says bearings look like this after using RPM Delo Oil

1. RPM Delo Diesel Engine Lubricating Oil contains anti-oxidant compound, resists effects of heat and air.
2. Gives bearings direct protection against corrosion.

DIESEL ENGINE RPM DELO LUBRICATING OIL

Note — arrange trial of RPM Delo Oil ... looks like it'll save us $$!

STANDARD OIL COMPANY OF CALIFORNIA ... San Francisco, Calif. STANDARD OIL COMPANY OF TEXAS ... El Paso, Texas
THE CALIFORNIA OIL COMPANY ... Denver, Colo. THE CALIFORNIA OIL COMPANY ... New York

Take the word of a Mine Superintendent who's been using Alcoa Aluminum beams for over three years

"Setting up this roof protection goes twice as fast—"

A four-inch Alcoa Aluminum H-Beam weighs only five pounds per foot.

Miners like to work with Alcoa Aluminum beams. Weighing much less than other beams, less time and fewer men are required to set them in place.

You can depend on Alcoa Aluminum beams for roof protection at your working faces. They're strong to start with, and they stay that way throughout the years. No rot or rusting to weaken or destroy their usefulness.

Aluminum beams can be used repeatedly as you advance or retreat from a working position. They are highly resistant to water and acid encountered in coal mines, so they have long life at work or in storage.

For complete data on Alcoa Aluminum Structural Shapes, get in touch with the nearby Alcoa office. Or write ALUMINUM COMPANY OF AMERICA, 1764 Gulf Building, Pittsburgh 19, Pennsylvania.

MORE people want **MORE** aluminum for **MORE** uses than ever

ALCOA ALUMINUM

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

For GOOD Going on Bad Ground

Unmatched flexibility...without complications of design or localized strain...is an outstanding advantage of Mack's Balanced Bogie for six-wheeled trucks and tractors.

- Long, many-leaved springs freely trunnioned to the frame and yieldingly attached to the axles by huge rubber Shock Insulators assure fully flexible suspension. Wheels conform freely to road irregularities without the slightest twisting stress upon the frame. Even when traversing rough ground which causes the axles to slant in opposite directions the frame maintains its proper midway position. The suspension also maintains positive alignment of the axles for true tracking either straight ahead or on curves.

- To its inherent flexibility the Mack bogie adds the benefits of equal traction, even tire loading and uniform braking on all four wheels--regardless of road conditions. Because of its simple, sturdy construction and balanced stress distribution maintenance is greatly reduced.

- The Mack bogie is built complete in Mack factories. Its advanced and simplified design is further evidence of the forward-looking engineering that goes into the making of a Mack.

Mack six-wheel trucks, embodying Mack's exclusive Balanced Bogie have earned an enviable reputation in quarrying and mining service because of their unfaltering ability to cope with the toughest terrain.

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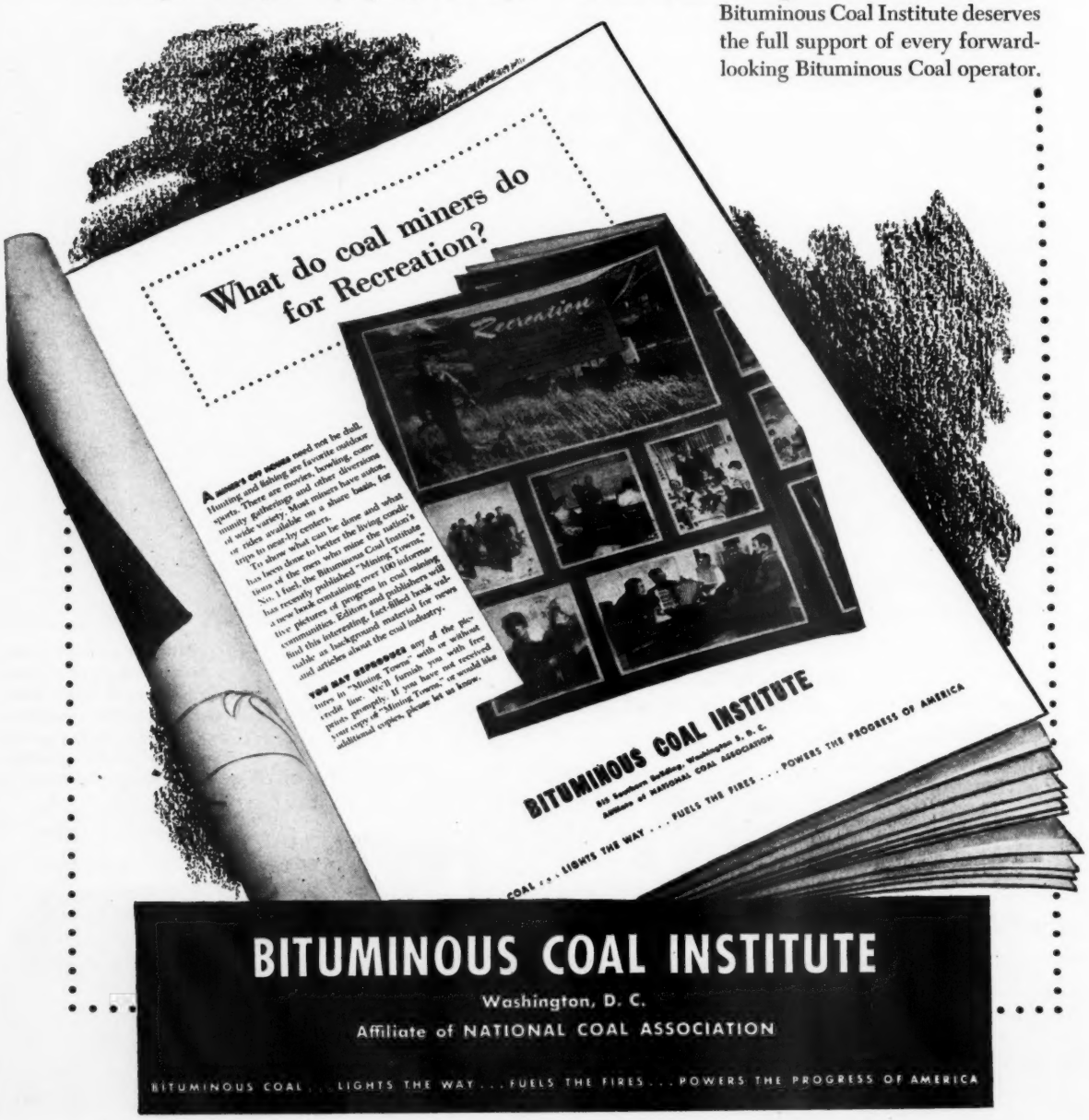
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Editorials

JULIAN W. FEISS, *Editor*

August, 1947

Not By a Dam Site!

THE making of a metal mining district is a slow and arduous task. Despite the popular myth that our great mineral developments have resulted from bonanzas, the history of mining tells us that even the accidental discovery of a rich deposit may not result in immediate benefit to mankind. Before a region can attain important production, a generation or more of development, research, and toil may be required.

The Metaline mining district in northeastern Washington has not deviated from the pattern. Recognizing the potential importance of the region as early as 1910, the U. S. Geological Survey has carried out extensive work in the area and in 1943 summarized the situation admirably in Professional Paper No. 202 as follows: "Development of the Metaline district has been slow and only in the last 10 or 12 years have large commercially available ore deposits been found. Evidence of mineralization near the surface is generally scattered, and the ore is developed only through expensive and persistent exploration."

Many ventures in the Metaline area have been fruitless. Mining enterprises were undertaken and abandoned; mills were constructed only to shut down. Fortunately there were always men with vision and enterprise available, men with faith in the district and faith in their own ability to succeed where others had failed.

Today there are three substantial operating properties in the district and a fourth about to begin production across the border in Canada. Confidence in Metaline appears to have been justified and with the aid of the U. S. Geological Survey and the Bureau of Mines, which conducted an extensive drilling program from 1943 to 1945, three distinct ore horizons have been developed. At last the Metaline district appears in the metals picture as a possible big producer.

Two years ago the Corps of Engineers of the U. S. Army proposed to construct a dam on the Pend Oreille River. Claiming today that some two million more kilowatts will be required to operate the Hanford plant of the Manhattan Project, and that the Grand Coulee Dam cannot supply this demand, the Corps of Engineers has recommended a dam that would raise the level of water from the Pend Oreille River to an elevation that would place 90 per cent of all known mineralized horizons within a possible zone of submergence. This project is proposed for a point just south of the international line. Another dam proposed at Springston, Idaho, on the Coeur d'Alene River, would back the water up to the mill of the Bunker Hill and Sullivan Mining and Concentrating Co., and flood a portion of the Pine Creek district.

There have been various estimates on the zinc-lead possibilities of Metaline. In 1945 Secretary of the Interior Ickes stated that the district had 19 million tons of ore in sight. One mine operator, in the light of more recent information, claims that the district may have a potential future tonnage of 25 times the magnitude of the former Secretary's figure. Irrespective of the accuracy of these estimates, all who have examined or studied the area are in agreement —Metaline has ore and a lot of it.

Considering our national need for new reserves to replace those mined out during the period of wartime demands, the attitude of the Corps of Engineers is incomprehensible. Dams on the Pend Oreille and Coeur d'Alene Rivers which would eliminate valuable existing resources of zinc and lead appear to be the height of folly.

It is probable that the dam on the Pend Oreille will never be built. International complications involving Canadian water rights may prevent its construction and experienced geologists have opposed the project because of unsuitable ground for foundation purposes. However, the battle is joined and despite the fact that there are other regions in the Columbia River basin where such dams could be placed, the Corps of Engineers is continuing to push both projects.

The Corps of Engineers cannot justify these dams nor can the mining industry approve any project that would endanger the Metaline and Coeur d'Alene districts—projects that might forever deprive the American people of a valuable natural resource.

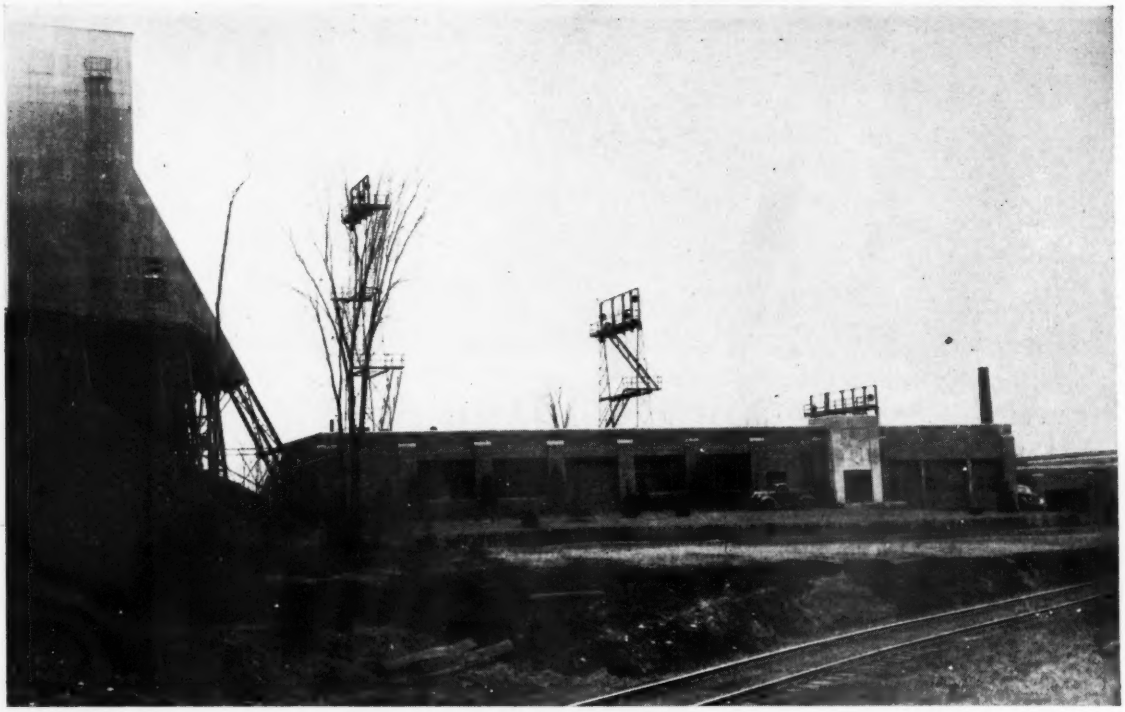


Fig. 1. Surface Plant at the Sherwood Mine

Underground Iron Ore Haulage By Belt Conveyor

The Application of Belts Underground in Iron Mining Is a New Development on the Menominee Range. The Conveyor System Herein Described Has Been Operated Successfully for a Year at Inland Steel's Sherwood Mine Near Iron River, Mich.

By PHILIP D. PEARSON
Mine Superintendent, Sherwood Mine
Inland Steel Company

Ten years of experience in iron mining with Inland Steel Co. have enabled Mr. Pearson to present this unusual analysis of conveyor practice

THE transportation of materials by means of belt conveyors has been employed for a long period of time. The application of belt conveyors in coal mines is not new, and in recent years there is a definite trend toward their use in open pit iron ore mines. These facts naturally would arouse in our minds the thought that belt conveyors might be used with equal success in underground iron ore mines.

Every mining district and all mines have problems that are peculiar to themselves. The Menominee Range and the Sherwood Mine are not exceptions to this fact, and the application of belt conveyors in an underground mine of this range is a new experiment and presents some additional angles to the many normal interesting problems of any belt installation.

It was after much thought and deliberation that a system of belt conveyors was conceived that could be used to replace locomotives and cars on the new 1,200-foot level of the Sherwood Mine. Whether belt conveyors will or will not replace former systems of transportations remains to be seen, and as time goes on we will be able to draw conclusions from our experiences in answer to this question.

The equipment for the conveyors arrived at the mine in Iron River, Michigan, during the summer and fall of the year 1946. Since a comparatively short period of time has elapsed since the original installation, this article will discuss the problems confronting us during the initial installation, and the conclusions drawn from it must be tempered with the information that more conclusive results will

be obtained and discussed after a longer period of time has elapsed.

When the original decision on the installation of belt conveyors was made, the basis for the decision were the following facts. First, that approximately five million tons of ore were expected to be moved on the 1,200-foot level. Second, that the cost of installation of the belt conveyor system would be $75,000. Third, that the estimated cost of transportation of five million tons of ore would be about $0.05 per ton including the depreciation of the equipment on five million tons without salvage value. This figure was computed from the cost experiences of other belt users. Fourth, that the 1944 cost of tramming, allowing for depreciation of tramming equipment over five million tons, would be $0.0893 per ton. Fifth, that the savings based on these figures would be between $0.03 and $0.04 per ton, or from $150,000 to $200,000 over the period of time of the life of the level. All these facts were based on the fact that there would be a steady and continuous production from the 1,200-foot level.

Using the above facts the decision to install belt conveyors on the 1,200-foot level was made, and the order for the original two conveyors was placed in August of 1945.

Mine Has Been Developed Since 1941

If you were to drive into the Sherwood Mine plant today, you would see a modern office, shops, engine house, shaft house, and other buildings similar to the buildings shown in Figure 1. The mine is comparatively new, having been opened in 1941. It is close to the city of Iron River, Michigan, on the Menominee Iron Range. The total property consists of two adjoining quarter-quarter sections with the long axis of the property in a north-south direction, a total of 80 acres. The estimated ore reserve is six million tons.

The ore formation on this land is highly folded, and the ore bodies are a dark red and brown hematite and limonite which lie in a large syncline with an east-west axis. The ore when broken underground varies from pieces larger than 12 inches (which are reduced to go through a 12-inch grizzly), to all sizes down to a fine powder. It has sharp edges when broken and it can be classified as a semi-hard iron ore. It is harder than the soft ores of the Marquette Range but not as hard as the so-called hard-ores. It was this semi-hard characteristic of the ore which presented a problem when the belts were considered and later when loading points were designed.

Scope of Problem

There were many problems and situations that arose because the Sherwood installation is the first of its kind on the range, and in this district, and for that matter in the State of Michigan.

Some of the problems that were foremost in our minds when we were faced with the installation of the belt conveyors were:

A. Transportation of conveyor equipment from freight cars to location on 1,200-ft. level.

B. Erection of conveyor equipment.

C. Lowering of belting through shaft.

D. Installing belting on completed conveyor.

E. Vulcanizing belt under moist conditions.

F. Designing and building of loading points.

G. Keeping records of amount of ore from each contract.

Preparatory Planning for Belt Layout

The description of the driving of the original drifts, the construction of pockets, and the other details that were carried on prior to the belt installation, are being omitted. Let us picture our problem at the stage where the storage pocket at the shaft is installed and the haulage drifts completed.

The pocket at the shaft has three compartments and has a capacity of 180 tons. Between this storage pocket and the shaft are two measuring pockets, each capable of holding exactly one skip (six tons). This particular pocket was not designed for the belt installation, but the head end of the belt installation was adapted to the pocket. A slight modification of this pocket could be made in future installations to make it more adaptable to use in conjunction with belt conveyors.

The main south cross cut from the shaft is in slate and ore. The east drift is in ore. Fig. 2 shows an isometric drawing of the two belt installations. This drawing shows timbering around the shaft pocket and at the end of the east drift. The progress of the installation, the length of the conveyors, their relationship one with the other, and other data are shown on this drawing, and I now draw your attention to it.

Because the drifts had been driven by conventional methods by using loaders and underground tram cars, the haulage track was located in the center of the drift. The first step taken in preparing for the installation of the conveyor equipment was the moving of the track from the center line of the drift to the side of the drift. After the track was moved, all loose material on the bottom of the drift was leveled to prepare the grade for the conveyor. Fig. 3 is a sketch of the final relationship between the track, conveyor, pipes, wires, etc., in the drift, and Fig. 4 is a picture showing the actual installations.

Installation of Belt Conveyors

The limiting factor of the size of any one piece of equipment was the length and width of our cage compartment in the shaft. These dimensions are 10 ft. 10½ in. x 5 ft. Another limiting factor was the height and width of the drifts on the 1,200-ft. level. These dimensions are shown in Fig. 3.

The first equipment that was lowered, consisting of chutes, supporting frames and head pulley, was erected over the pocket at the shaft. This equipment and the first 70 feet of conveyor supporting frames and stringer frames were erected on prepared foundations. The subsequent portion of the conveyor supporting frames and stringer frames were blocked in place and the foundations poured below the legs. Four stringer frames (24 in. long) were blocked at one time and then bases poured. An inch was allowed for blocking and grouting on the No. 1 conveyor but no allowance was made on the No. 2 conveyor. It was found that by careful blocking of the stringer sections and legs, much time was saved. All concrete bases were set on solid ground.

As the stringer sections were erected, the rollers were installed on the sections. After all the rollers were installed and both end rollers in place, the elevation and alignment were checked carefully and the rollers adjusted. The first check on the elevation and alignment was made on the stringer sections, and throughout all the erection work an effort was made to keep the equipment exactly on grade in alignment. Our efforts paid dividends when the time arrived to train the belts.

When the erection of the No. 1 conveyor reached completion, the No. 2 conveyor was erected in the east drift running at right angles to the first conveyor. The head end of No. 2 rises above the tail end of No. 1 and provisions have been made at this part of the equipment for a No. 3 conveyor in the west drift. Fig. 5 shows the head end of No. 2 conveyor where ore passes onto No. 1 conveyor. The No. 2 conveyor was erected in the same manner as No. 1. No. 3 conveyor has been ordered and will be erected during this coming fall.

The next task which gave us some concern, was to lower the four rolls of belting and to move the belting

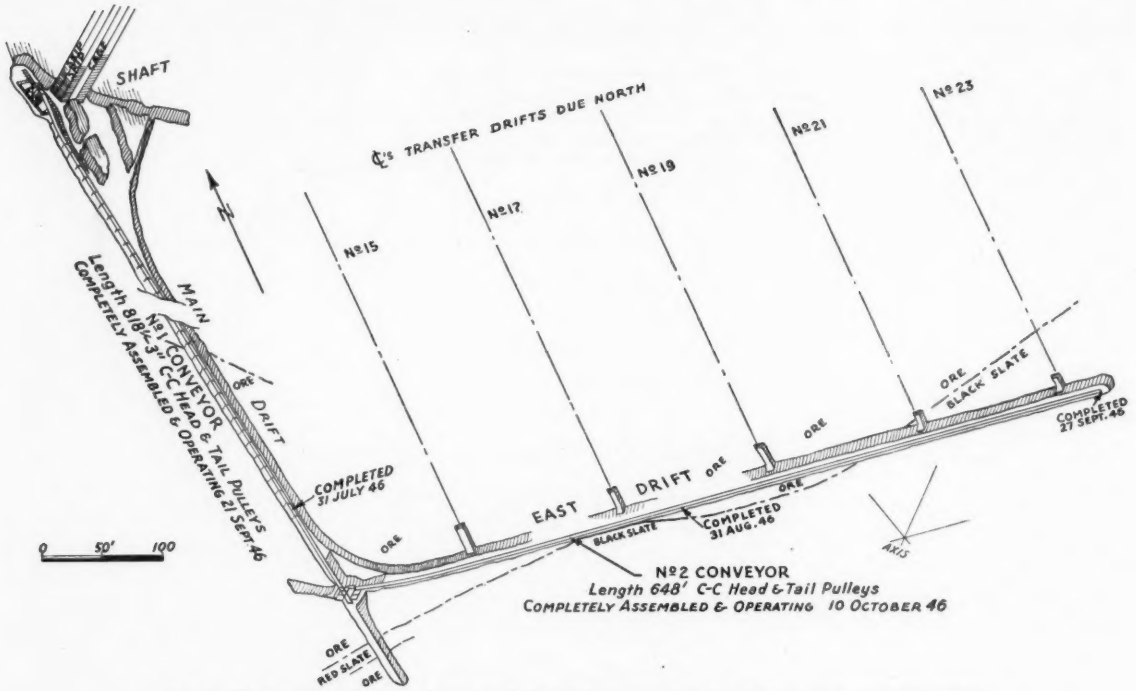


Fig. 2. This isometric drawing shows two belt installations and their relationship to the shaft pocket

onto the conveyors. In order to test our method of lowering the heavy rolls, the small 667-ft. roll (four tons) was lowered first. The roll was suspended below the bottom of the cage by wire ropes attached to an axle through the center of the roll. The ropes suspending the roll were attached directly to the cage hoisting ropes and not to the cage proper. An independent rope also was attached around the belt to hold it in the event the first one did not hold. We experienced no difficulty in lowering this first belt and we then lowered the 1,023-ft. roll (six tons) by the same method. There was a clearance of two inches on each end of this large roll in the long dimension, but the roll hung steady and was lowered without any mishaps. The roll was pulled from beneath the cage to the plat on the 1,200-ft. level and then mounted on supports in readiness for rolling onto the No. 1 conveyor.

When the two pieces of belting, the 667-ft. piece and the 1,023-ft. piece, were in place on the first conveyor, the belt was made endless by vulcanizing. The belt was joined by step splices, and when the job was completed it was difficult to see where the joints had been made. The two pieces for the second conveyor were joined in like manner.

The installed belt conveyors have the following characteristics:

	Conveyor No. 1	Conveyor No. 2
Width of belt	36 in.	36 in.
Center to center end pulleys	818 ft. 3 in.	648 ft. 0 in.
Lift	6 ft. 6 in.	6 ft. 6 in.
Capacity—Tons per hour	250	250
Speed—Feet per minute	200	200
A-C Motors—Horsepower	20	20

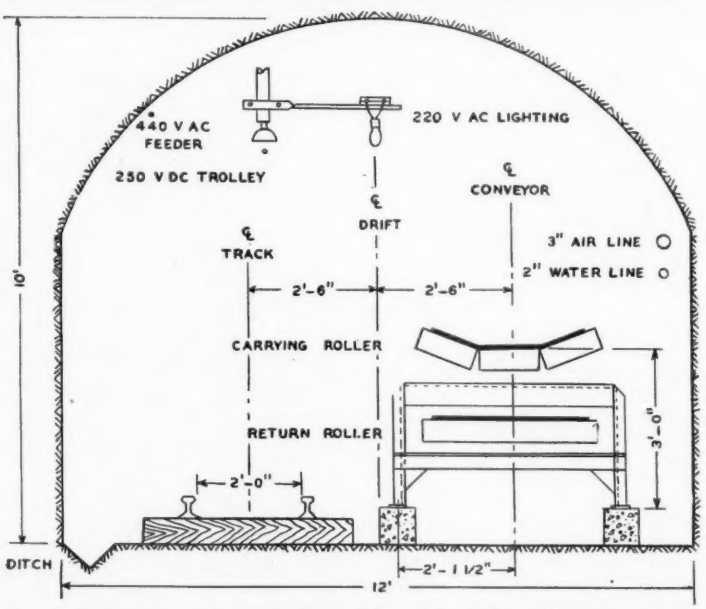


Fig. 3. Cross section of conveyor installation showing position of conveyor, track, pipes, and wires

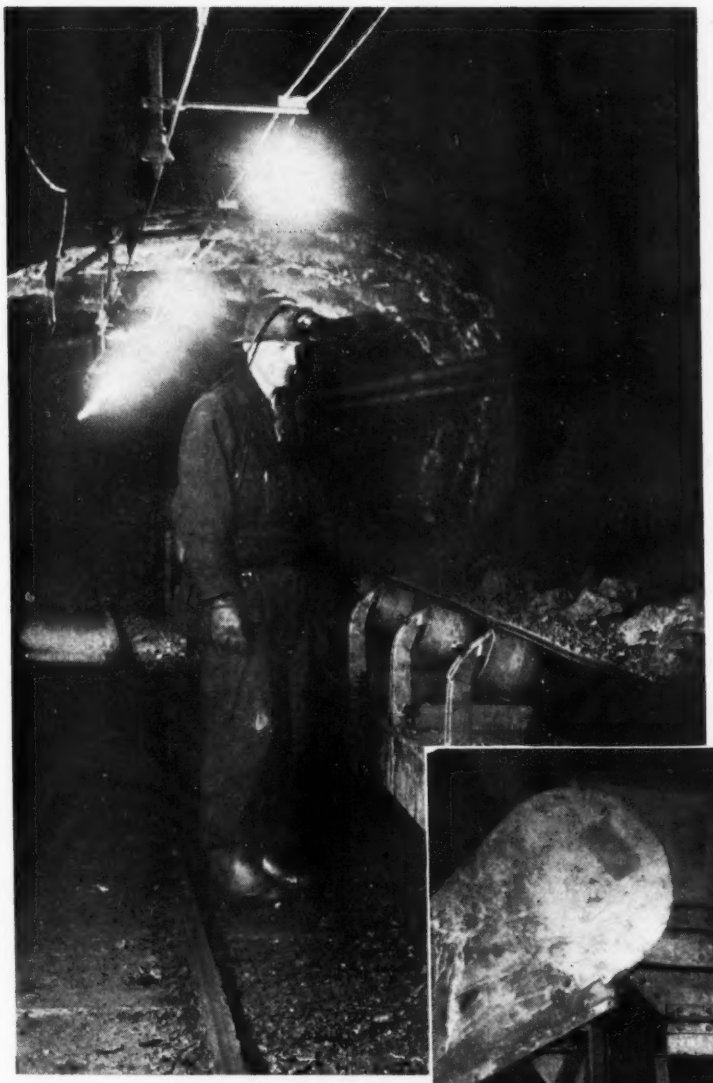


Fig. 4. Above. The conveyor installation in operation

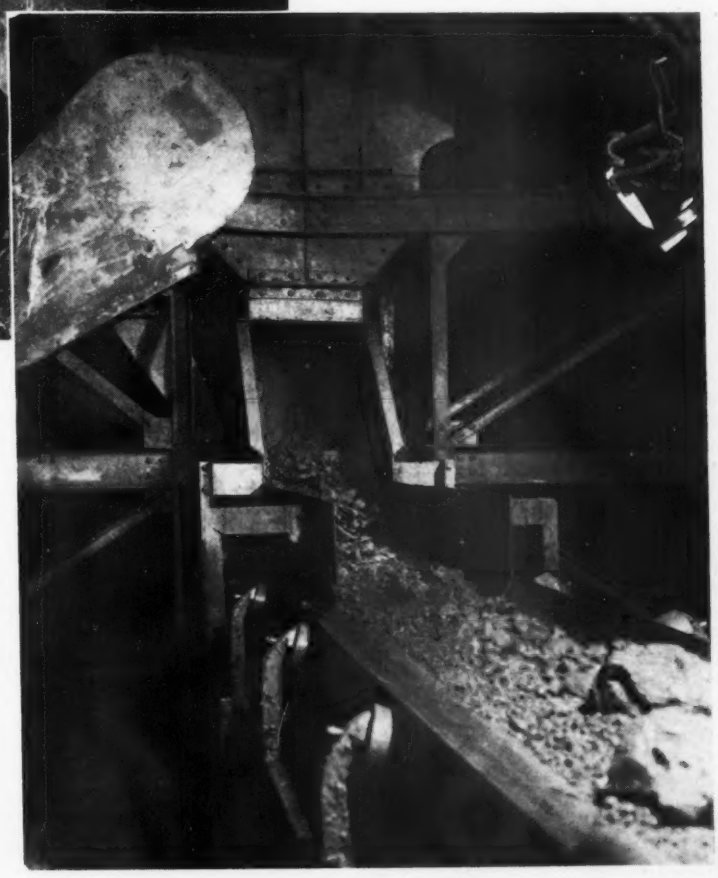


Fig. 5. The ore transfer point for No. 1 and No. 2 conveyors

Loading Points Carefully Designed

One of the initial problems with which we were faced was the problem of the design and erection of equipment to be used in the loading of the belts with the material from the stope transfer sub levels. After some research, it was decided to keep the design as simple as possible. A chute was designed and made of steel. It consists of a V-shaped chute with a vertical angle of approximately 45 degrees. Fig. 6 shows a shaker chute loading onto No. 2 belt. The sole function of the chute is to change the direction of the material from the shaker conveyors because these conveyors are at right angles to the belt. The shaker conveyors run north-south and the belt runs east-west. The chute is so designed that it can be raised to allow material from other stopes to pass under it. Fig. 7 shows a typical stope with the transfer sub level at the bottom through which the ore passes on shaker conveyors to the belt proper.

Our particular loading points serve their purpose but new points will be of a somewhat different design based on our experience with these.

The loading of the belt is important because if the belt does not have the load in the exact center the belt will ride up out of the roller trough and might rub at the head and tail end of the conveyor.

Mining Methods

Sub level stoping is the predominant method of mining at the Sherwood Mine. There are several variations within the sub level stoping methods but for our purpose I will give a description of the methods employed in the stopes feeding the belt.

Fig. 7 shows a typical cross section of a stope. This particular stope runs at right angles to the No. 2 belt. Shaker conveyors carry the

Fig. 6. A shaker chute permits a change in direction of the material

ore from the stope raises to the belt. In observing this illustration you will see that the stope conforms very much to normal sub level stoping on the Menominee Range with the exception of the 35-ft. intervals betwen subs.

The sub levels are in the center of the 80-ft. width of ore, and from these sub levels long holes are drilled upward to form a ring. The ring consists of nine holes ranging in length from 15 ft. to 40 ft., and the holes are charged with 2x16-in. powder and blasted with primacord. In this type of drilling and blasting, the mining starts at the top sub level and works down, whereas in the old method of benching, the mining starts on the bottom sub and works up undercutting each sub.

To describe briefly the mining cycle, we normally have three miners in the stope, two of whom drill the ring and blast it and carry on development in the stope itself. The third man works on the grizzly and operates the shaker chute to take the ore out of the stope to the No. 2 belt. From this belt it goes onto the No. 1 belt, into the storage pocket to the measuring pockets, from the pockets to the skips, to the headframe on surface, through the crusher to the stockpile by dumptor truck or directly to railroad cars for shipment to Escanaba on Lake Michigan, into ore boats to lower lake ports.

Methods of Measuring Ore Between Contracts

It was first thought that some expensive weighing devices would be necessary to keep account of the amount of ore travelling over the belts from more than one working contract.

We have this problem very well under control. To keep account of the ore from the various contracts we employ several practices. First, we have three compartments in the storage pocket at the shaft. Second, we know the capacity of the grizzly raises in each contract. Third, we can compute the cubic content of the drifts and raises. Fourth, we shake ore heavily from one stope on the day shift and from the other stope on the night shift. By applying one or more of these four methods we have been able so far to keep an accurate record of the ore from each contract. An accurate check is the number of skips hoisted from the pocket.

Costs

Because the conveyor belt has been in operation but a short time, any close comparison of costs, with the exception of the initial installation costs, will be left for a subsequent study.

In the early part of this article,

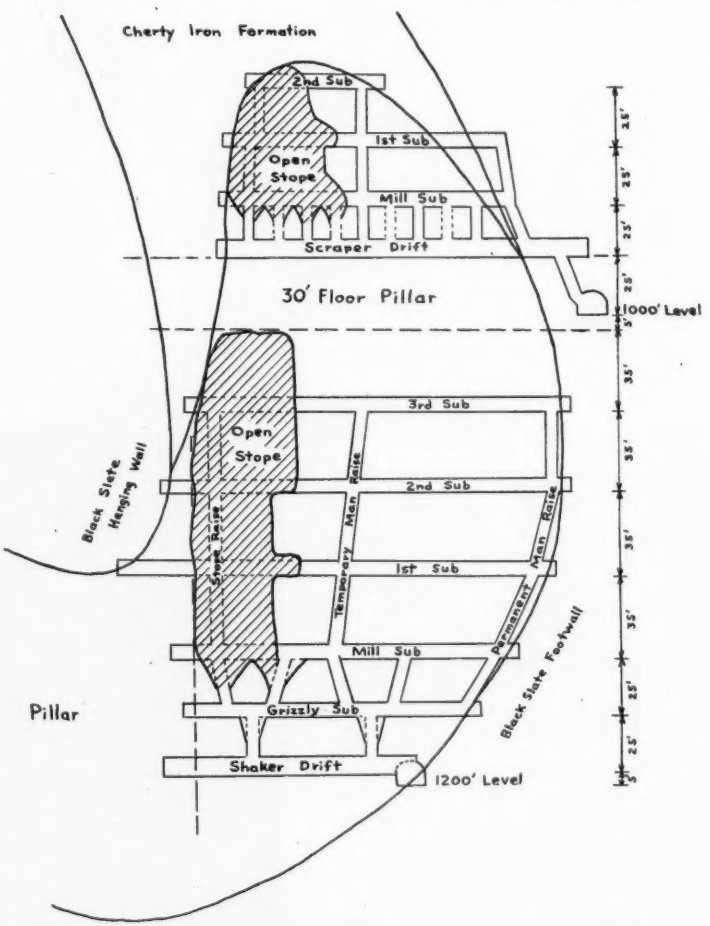


Fig. 7. A typical stope showing shaker conveyor sub level as used for loading onto belts

mention was made that the cost of the belt conveyor system was estimated to be $75,000. The table below shows a total cost of $90,000. The cost, as is evident, was greater than originally estimated and was brought about by the increase in the cost of materials and labor during the past two years. See Table I.

Table I—Initial Cost of Equipment

Trolley Locomotives and Cars		Belt Conveyors	
2—Six-ton locomotives	$18,000	Nos. 1 & 2 Conveyors and belts	$51,000
32—Cars @ $1,200	38,400	Installation	6,000
3—Car dumps @ $1,300	3,900	No. 3 Conveyor and belt	30,000
		Installation	3,000
Total	$60,300	Total	$90,000

The prices of the locomotives and cars were determined by taking the cost of equipment at the time of its purchase for the 1,000-ft. level in 1941 and adding 50 per cent. The belt conveyor prices are actual present day prices; in fact the largest increase in price comes in the No. 3 belt conveyor, or in the cost of the conveyor that has been purchased most recently and as yet has not been installed.

A study of the electrical current requirements has been made of the locomotive and car haulage system on the 1,000-ft. level and the belt conveyors on the 1,200-ft. level, and the results obtained are shown in Table II.

Table II

	Six-ton locomotive and nine cars (five-ton capacity)	36 in. belt conveyor
Tons per hour	100 max.	250
Tons per KWH	2.4	8.3
KWH per ton	.42	.12
Power cost per 1,000 tons ($.013 per KWH)	$5.46	$1.56

Cost savings are expected in the labor for moving ore by belt in contrast with labor costs for moving ore by tram car, since two men are required to operate the belts and three- and four-man tramming crews are used for tram car transportation. With constantly increasing wages, a small saving in manpower brings about a large saving in cost per ton.

The standard figures that we continually keep before us when making changes in operation are the "cost per ton," "tons per man-shift," "tons per pound of powder," and "tons per foot of hole drilled." The belt conveyor will have a definite influence on all of these figures.

Conclusions

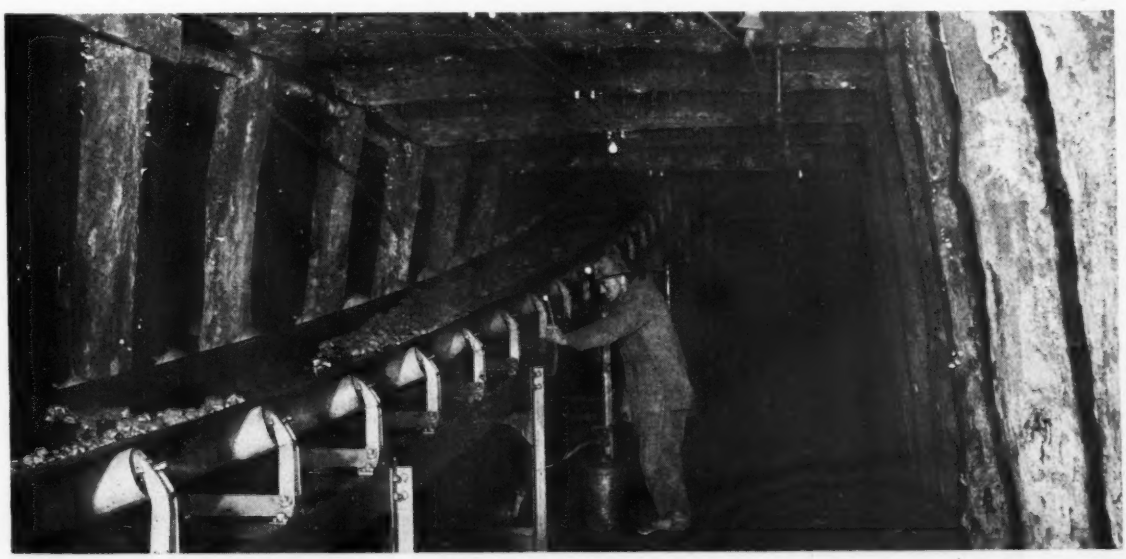
The Sherwood Mine belt conveyor installation is comparatively new and because of this fact it would be unwise to make broad definite statements about its success or failure. All the conclusions that follow must be tempered with the thought that some time in the future a second part of this article will contain more conclusive detailed statements, and reactions covering a longer period of time.

We are firmly convinced, however, that belts have a place in underground haulage of iron ore and that the future will see a trend in that direction. We expect to become more adept in the application of belts to our haulage problems and to find more applications for the continuous method of moving materials as time goes on, and we expect to work in that direction.

A striking comment from several of the coal mine conveyor men when they see our conveyor installation is that it is more elaborate and permanent than they are accustomed to seeing in the coal mines. This makes an interesting contrast; namely, that the coal conveyors are moved often and are not as permanent as our installation. These men are also accustomed to conveyors erected at a lower elevation than our installation. We have endeavored to erect a very good conveyor. If we have erred it is on the side of being too careful.

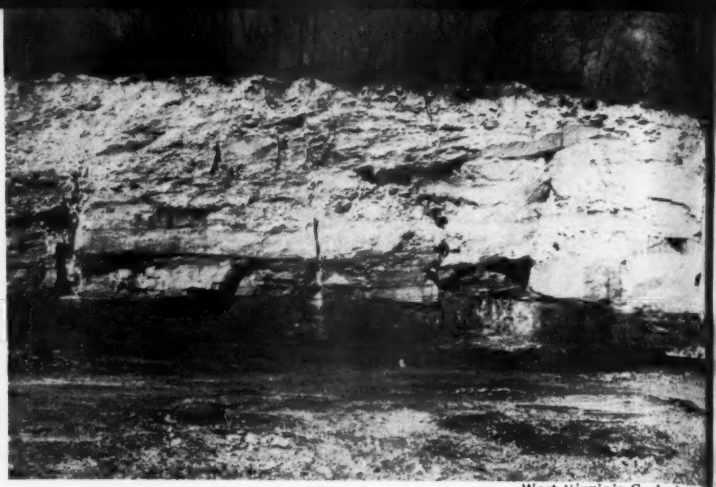
The foremen and the men who work with the belts are enthusiastic about the belt installation and feel that belts have come to stay in underground iron mines. We in management concur with this view.

In summary, let us ask why did we go to belts and we have answered in detail, to improve the amount of material moved over a given length of time and to produce ore at a lower over-all cost per ton. How we installed the belt has been described in detail. How much material we move and how much savings we attain will be discussed subsequently when larger tonnages have passed over the belts.



West Virginia Geological Survey.

A surface plant for a small producer



West Virginia Geological Su

A highwall exposure ready for deep mining

Highwall Mining

Strip Pits Have Opened Numerous Areas of Coal That Are Available for Low-Cost Mechanical Deep Mining

★

By G. B. SOUTHWARD
Mechanization Engineer
American Mining Congress

★

AN OPPORTUNITY for producing deep mined coal at a cost considerably lower than average, is offered to the industry—or rather to those who can take advantage of the situation—by numerous abandoned strip pits. In these locations, the seam exposure along the highwall provides ready-made portals for drift openings and also gives an accurate preview of the mining characteristics of the coal and the overlying strata.

Quite a number of "country banks" are already working in strip pits; these are rather primitive, simply gouging into the outcrop without any system or any equipment except hand tools. But there is another type of highwall operation possible; a mine located in a small acreage and with an expectant short life but nevertheless equipped mechanically and using modern technique. Such a mine can produce coal at a low cost and of a quality that will compete on the open market with similar coals of its field.

There are obvious advantages for an operation of this type. That is—cost advantages. To begin with, there is no expense for constructing the mine portal and, in fact, several portals can be opened as needed to reduce the length of the main haulage, as well as the territory to be maintained underground. With mechanical cutting, loading and gathering, the mining can be confined to one working panel, and if this is done, the other items such as drainage, ventilation and power—will present no problems.

All these facilities can be installed and operated according to the most modern specifications for supervision, efficiency and safety, but through the reduction of overhead and mine maintenance, the total cost will be below that of a large producer in the same field. In fact, when the coal is loaded underground and starts from the working panel to the outside, most of the cost is over. Of course, if mechanical cleaning is essential, an existing surface preparation plant must be available.

Highwall mining is not a new idea and for some years past—particularly in the Middle West—it has been practiced to a greater or less degree. In such cases, the deep mine is often operated in conjunction with the strip pit—using its facilities for haulage, cleaning, carloading, etc. But the strip operations in the hills and mountains of the Appalachian field are not so adaptable to this combination method: they mine narrow hillside outcrops, leaving miles of exposed coal in the highwalls.

Many of these stripping operations are along the frontage of large bodies of deep-lying coal which are already being mined, or else at some future date will be mined by some large producer. This article does not refer to areas of that nature. There are, however, numerous other places where the outcrop has been stripped, leaving comparatively small acreages under cover that are practically cut off from the main body of the deep-lying seam beyond. Such acreages are particularly suitable for small tonnage mechanical underground operations where the cost for mining equipment and outside facilities can be kept down to a minimum.

The following article by F. O. Johnson, illustrates an operation of this type, and although it is not working a highwall, the methods used are directly adaptable to many stripped properties.

Easy mine openings provided

Elevating conveyor loads from shuttle into mine car

★

By F. O. JOHNSON

General Superintendent
Rosedale Coal Company

★

Low-Cost Mechanical Operation

The New Mine of the Rosedale Coal Company of Maidsville, W. Va., is Setting Some Cost and Production Records for Mechanical Loading

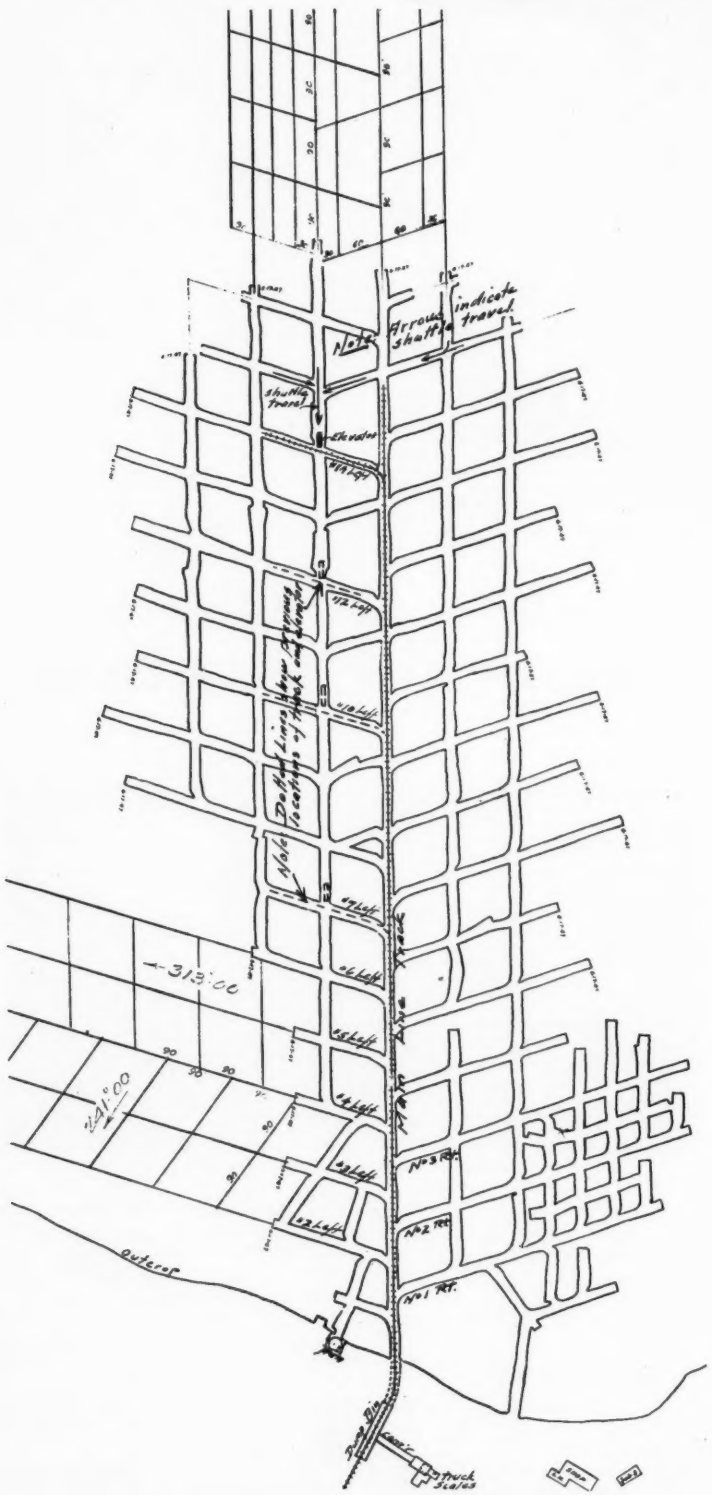
Tire mounted cutting and shearing machine

OPENING a mine at the outcrop with one pair of entries, increasing these to a six-entry panel, driving them for a distance of 1,500 ft. in four months and at the same time reaching a production of 800 tons per day on double shift, is a record of which our organization is proud. This mine —100 per cent mechanical loading— was planned for low-cost operation and by taking advantage of several favoring circumstances that exist on the property, we have succeeded in reaching a production cost that is well below the average for our field. We feel we are in a position to pass fair judgment on this question because our operating experience in northern West Virginia dates back over a number of years and in addition to the mine that will be described here, we have other deep and open-pit operations from which we can draw comparisons.

Operating Method

Our Rosedale Mine No. 7 is a drift opening located in Greene County, Pennsylvania just across the West Virginia line. The seam worked is the Sewickley, a high-quality steam and coking coal with excellent mining conditions. The height is from 5½ to 6 ft.; the top is hard slate and requires practically no timbering in the development work now being driven. Grades are light, the bottom is hard and very little water has been encountered; a combination well suited for rubber-tired haulage. There are no partings in the main body of the seam, but there is a band of slate at the top which seldom has a thickness of more than 2 in. and as it separates freely from the coal, it can be removed by hand-picking. This, for the most part, is done at the tipple.

The mining plan shown on the accompanying map, consists of a set of six main entries that are being developed on the block system. The blocks are made by headings and cross cuts driven on 90-ft. centers and



Mine map showing four months' development

on 72-degree angles; this angle facilitates the mechanical loading and cutting when turning the room necks but is near enough square to avoid sharp points on the pillars. All places in the development are driven 12 ft. wide.

The mine at present has only one operating unit—a Joy 14-BU loading machine served by two shuttle cars of 5 ton capacity. These transport the coal for short distances and discharge into a trip of mine cars which are hauled by locomotive to the tipple. The coal is undercut and sheared by a Sullivan 10 RU tire-mounted machine with a 9-ft. cutter bar. The shear cut is taken either in the center of the face or on the side as conditions indicate. Drilling is with a Jeffrey hand-held electric drill; this is carried on the cutting machine and the cutting crew drills the shot holes. Shooting is with permissible explosive and is done during the working shift by a two-man crew. All the mobile machines—cutter, loader, shuttles—use trailing cables, taking their power from the trolley wire at 250 v.d.c; the drill plugs into the cutting machine.

Main and Gathering Haulage

The mine cars are drop-bottom, steel construction, with a capacity of about five tons. These are placed at the loading elevator in eight car trips and are moved as loaded by a six-ton General Electric gathering locomotive. This one locomotive, in addition to serving at the loading point, also hauls the trips to and from the tipple, making the run in the interval when the loading unit is tramming from one working place to another. As the present haul to the outside is very short, the time for the locomotive round trip is about the same as the time for tramming the loading unit, so that there is no appreciable delay occasioned.

The car loading station where the shuttles discharge, has a Joy elevating conveyor that loads the mine cars in a solid trip; this station is a simple installation made by shooting down some top to provide height for the elevator head. It is located at the intersection of the first entry to the left off the main where there is straight loading over the side of the cars and ample standing room for the trip off the main line. Also, as will be noted on the map, the entry is widened to permit two shuttles passing at the approach to the elevating conveyor.

A particular feature which should be mentioned here is the ease with which the loading point is moved ahead. This move occasions practically no loss to the loading machine production, although it is done during the regular working shift. The sta-

tions are spaced at short intervals—180 ft. apart—and the elevator which is mounted on wheels, is pulled forward to its next position by the loading machine. Before moving, the track work at the place ahead has been completed from the main entry around to the station location and after the elevator has been pulled into its new position, there are only a few straight rails to lay inbye. These are on steel ties and are quickly placed. The top has, of course, been previously shot out to provide the necessary height for the elevator to load over the side of the mine car.

Slate handling underground is at a very minimum. There is only one parting in the seam which, for the most part, is loaded with the coal and picked out at the tipple. The rock which is shot down at the elevator station is generally stowed by the loading machine in a nearby breakthrough. Roof falls in the mine so far have been almost non-existent.

The cars are hauled to the tipple by the 6-ton gathering locomotive which serves at the inside loading point. These cars, being of the drop-bottom type, are quickly dumped at the bin and the trip is returned inside without uncoupling or switching. The track is 40-lb. rail laid on 4-in. x 6-in. wood ties on the main line; the track from the main line to the loading point is on steel ties. The trolley is 4/0 with power at 250 v.d.c. from a 100-kw. General Electric motor generator which serves the entire operation. A 500,000 circular mill feeder cable is used to carry sufficient power to the working sections.

Development Speed Unusual

The mine is worked double shift with all operations on a continuous cycle—cutting, drilling, shooting, loading, etc., in sequence. A third shift with a small crew does the oiling, greasing, general machine maintenance, delivers supplies and may also do some track work to finish out the shift.

A total of 30 men comprise the regular crews for all operations underground and as far as dumping the coal into the main bin. Beyond this point there is an outside crew consisting of three slate pickers, a weigh man and a shop repairman who also has charge of the lamp-house. The bin capacity of 600 tons takes care of the coal loaded by the second shift, so it is only necessary to have the slate-picking crew and the truck haulage on one shift.

The working section underground consists of six entries and six cross cuts, usually a total of 12 places. All places are driven 12 ft. wide and a cut will produce an average of from 20 to 25 tons. The shift production will run between 350 and 400 tons, which means that there are from 12 to 16 clean-ups per shift. Each place, therefore, averages more than one cut per day. The rapid rate of mining in this concentrated system is evidenced by the progress shown in the accompanying mine map. The first coal was loaded out of the drift mouth on February 18, 1947; the map shown was extended on June 17, 1947; so all of this development was done in a period of four months.

The first mine car loading station was established at the intersection of No. 7 left and the main line with the elevator loading the cars on a curved track. This was found to be very unsatisfactory and after a few days' operation the elevator was moved up into No. 7 left at the intersection of the first cross cut. This latter system has proven very efficient from all viewpoints; the mine cars are fully loaded on straight track and the trips are handled entirely off the main line.

The only objection to the mining plan as operated thus far has been that the shuttles have a maximum travel of about 450 ft., which we consider to be beyond the economic limit for our system. Accordingly, a new plan that is now just going into effect is shown on the map at the head of the development. As will be seen, this consists of nine instead of six entries; the main heading has a 60-ft. pillar on each side, but all of the other entries will drive on 30-ft. centers. We believe that the narrow centers will not cause any roof trouble and this arrangement reduces the maximum travel of the shuttle to about 300 ft. Also, the nine entries will provide a greater number of working places than the present system of six entries.

Surface Plant Simple and Efficient

The outside facilities are efficient but comparatively simple. The mine cars dump into a 600-ton bin located just outside the drift mouth and as the seam outcrops about 75 ft. above stream level, there is ample height for a bin of this size. Coal is taken from the bottom of the bin by a reciprocating plate feeder onto a 5-ft. belt conveyor which travels up a 17-degree slope to the top of a smaller bin (100 tons) from which trucks are loaded. The top 10 ft. of this belt is used as a picking table where hand pickers remove the small amount of slate occuring and make a clean product. The coal is not screened but is prepared as r.o.m.

Trucks are loaded under this bin where there is a set of platform scales which weigh the coal. The scales were furnished by the Howe Scale Company and have luminous visible weight readings. The trucks haul over the highway for a distance of three miles to the tipple of our company. This is located on the Monongahela River and also on the Monongahela Branch of the Pennsylvania Railroad and has facilities for loading into railroad cars and into river barges. These trucks are the regular highway type.

Outside slate disposal is not and probably will not be much of a problem. The pickings from the conveyor belt go into a bin alongside of the coal bin and are taken by trucks to the disposal pile about 300 yards away. Slate cars coming from inside the mine go through the coal dump to a slate bin from which a chute loads into trucks.

Conclusion

It is worth repeating that this production of from 700 to 800 tons per day is made with only one operating unit and a crew of 30 men underground. It is also worth repeating that the development shown on the accompanying map was made in only four months' time—starting with one pair of entries at the drift mouth. The underground equipment consists of one loading machine, two shuttle cars, one cutting machine, one drill, one six-ton gathering locomotive and eight mine cars. It is, of course, true that the short haulage distance makes it possible to get this production with only one locomotive and eight cars; a main line locomotive will eventually have to be added as the mine develops, but the rest of the panel equipment will remain constant.

When a main line locomotive becomes necessary we plan to increase our production by adding another operating unit in a new panel, driving to the left near the portal which is shown in projection on the mine map. At that time we will increase our substation capacity to 250 kva. and will add a power line feeder to the trolley. The present mine fan—a 5-ft. Robinson disk type—should take care of the future extensions.

The mine is not projected for a long life—perhaps 10 years—and for that reason it has been possible to economize on the plant equipment in a way that would not be economical in a long-life operation. However, all our facilities are adequate and although the tipple, bins and other plant buildings are of wood construction and have no "fancy work," they are well built and will serve very effectively for our proposed tonnage.

The mine projection, the operating method, as well as the surface structures, were all designed by our own organization. This consists of John L. Hatfield, president; T. J. Johnson, vice president and general manager of mines; Fred. O. Johnson, general superintendent; Thomas B. Sullivan, general mine foreman; C. W. McCutcheon, mining engineer; and B. M. Chaplin, construction foreman.

Uranium and Thorium Prospecting With the Geiger Counter

★

By JACK DE MENT
Research Chemist

★

Many have assumed that exploration for radioactive substances requires bulky and complicated equipment coupled with an extensive knowledge of physics and electronics. This is far from the case. The technique of radioactive prospecting is by no means difficult, and light portable equipment, no larger than a medium-sized camera, is available for the purpose. The importance of uranium and thorium in the era of atomic power requires little comment. Of additional interest to the prospector is the fact that the presence of radioactivity is often a guide to other important minerals, including ores of vanadium, columbium and tantalum.

BEFORE the turn of the century the elements uranium and thorium were looked upon as nothing extraordinary, being studied by the classical methods of chemistry. The more than 100 minerals known to bear these elements are described in the literature of the last 150 years and, in fact, the principal uranium ore mineral—pitchblende—can be found listed in the early eighteenth century descriptive mineralogies.

With the discovery of radium new knowledge and techniques became available and these have since completely supplanted many classical methods of analytical and mineralogical chemistry. These modern methods are in general based on *radioactivity*.

Radioactivity is manifested by its several effects upon matter. A photographic emulsion will become "light-struck" or exposed when struck by radioactive radiations. Luminescent substances are rendered luminous by these radiations. And, most important of all, gases which are ordinarily nonconductive to electricity are ionized so that they pass electricity. Hence, present-day methods for determining the presence or absence of a radioactive material rely upon instruments and methods which utilize one or more of these effects.

Radioactive Minerals

There are three general types of radioactive, i.e., uranium and thorium bearing, minerals: (1) The primary uranium minerals or uraninites, (2) the secondary uranium minerals, and (3) the so-called "complexes," columbium-titanium tantalates of the rare earths, uranium and thorium, including silica. The important uranium mineral species are given in Table 1.

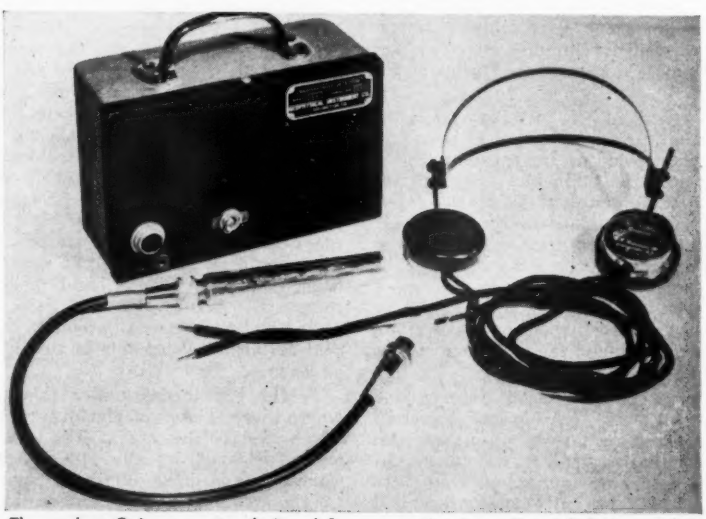
Type 1—The uraninites, which are the richest in uranium, include such crystalline varieties as broeggerite, cleveite, and certain uraninites found in the United States and East Africa. These varieties occur in pegmatites in well-developed crystals, though these crystals rarely exceed two centimeters in diameter. Pitchblendes are amorphous uraninites, and they occur in metalliferous veins, especially associated with sulfides of silver, lead, nickel, zinc, and other heavy metals.

The terms "uraninite" and "pitchblende" are often used synonymously, but the term "pitchblende" is applicable only to the impure, amorphous form of the mineral, often with

TABLE 1
IMPORTANT URANIUM MINERALS

Mineral	Per Cent U_3O_8	Type
Ampangabeite	14–20	3
Auntunite	60	2
Betafite	36–30	2
Blomstrandite	20	3
Broeggerite	77	1
Carnotite	61–77	2
Chalcolite	55–60	2
Cleveite	57–72	1
Curite	up to 73	2
Euxenite	3–19	3
Fergusonite	2–9	3
Gummite	60–70	2
Johannite	66	2
Leibigite	37–38	2
Pitchblende	75–95	1
Samarskite	3–16	3
Thorianite	5–12	1 or 2 ?
Troegerite	66	2
Uraninite	See Pitchblende	
Uranophane	52–65	2

U_3O_8 contains 84.85 per cent uranium metal.



The modern Geiger counter designed for prospecting is small and light in weight

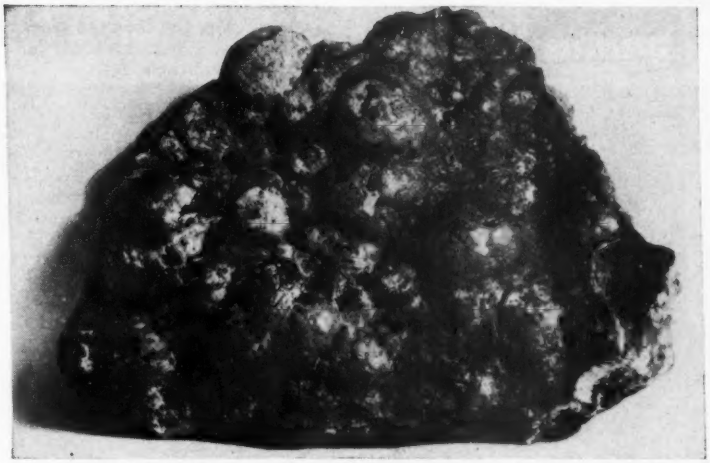
botryoidal surfaces and a conchoidal fracture. Uraninite, when crystallized, belongs to the isometric system. It is black or grayish-black in color, often with a glossy or pitchlike luster. The hardness is approximately that of steel (5.5). Its specific gravity is often high (5 to 9.7), according to its purity. The composition is somewhat indefinite, and it is usually described as a uranate of UO_2, together with variable quantities of lead, calcium, iron, copper, bismuth, thorium, zirconium, and other rare and common elements.

Type 2—The various secondary uranium minerals include phosphates, carbonates, aresenates, sulfates, silicates, vanadates, and uranates. Most of these are characteristically colored bright green or yellow. The most important are autunite and carnotite. Formed relatively recently, these secondary minerals have not reached equilibrium (1Ra:3.4 million U). The uranium-radium ratio, therefore, may vary over fairly wide limits.

Carnotite is an amorphous, soft, powdery material, occasionally talcose or waxy in character. The color is generally brilliant canary yellow, though it may be discolored by iron, organic matter, or other substances. It is essentially a hydrous potassium uranium vanadate, sometimes associated with the hydrous calcium ranium vanadate, known as tyuyamunite. Carnotite is the principal ore mineral in the United States and tyuyamunite is found in Russia. Autunite, found in Portugal, is a phosphate of uranium and lime, containing as much as 50 per cent of uranium. The color is described as greenish-brown to sulfur-yellow. It is soft (hardness 2 to 2.5) and rather light (specific gravity 3.5 to 3.9). Torbernite (or chalcolite) is a green-colored mineral of similar composition, containing copper instead of calcium.

Type 3—The columbium-titanium tantalate complexes include betafite, samiresite, ampangabeite, euxenite, blomstrandite, samarskite, fergusonite, and other minerals. These substances have rather common characteristics and are easily recognized because of their high density (over 4), black or dark-brown color, and greasy, brilliant fracture. Minerals of this group were first discovered in Norway and Greenland (euxenite, blomstrandite, samarskite, and fergusonite). Later a deposit of euxenite was found in Brazil, but now by far the most important deposits are those in Madagascar, which furnish several unique varieties, notably betafite, samiresite, and ampangabeite, all of which are rich in uranium. Certain minerals of this group contain thorium in varying amounts, and the radium extracted from them may contain substantial quantities of mesothorium.

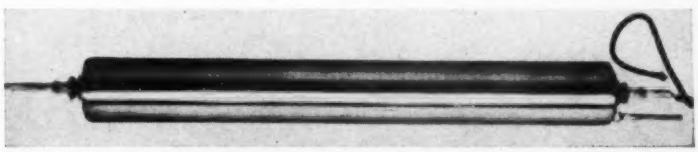
The principal thorium mineral is monazite, an anhydrous phosphate of the rare earths cerium, lanthanum, neodymium, praseodymium, yttrium, and erbium. Thoria is not an essential constituent but is always present in quantities ranging from 1 to 12 per cent. Monazite yields a little radium and uranium, as well as mesothorium. A ton of monazite containing 5 per cent of thorium will contain about 6.4 milligrams of mesothorium.



Botryoidal pitchblende from the El Dorado Mine, Great Bear Lake, Canada

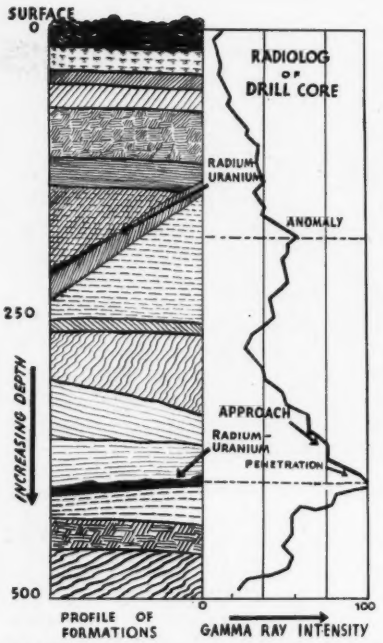
Prospecting

Uranium ores are spotty and irregularly distributed, usually in relatively small deposits, and prospecting constitutes in all localities an important factor even after commercial develop-



An all-metal Geiger counter tube manufactured by Geophysical Instrument Co. is ruggedly designed for field prospecting

Geiger counter tubes are made in many sizes and designs. The three shown, manufactured by North American Phillips Co., Inc., are designed for research and analysis purposes



Radiolog of drill core showing essential features on approaching radioactive mineral which is not penetrated (the anomaly) and values observed when a richer body of ore is approached and finally penetrated by the bit

ment has commenced. Many of the uranium minerals are brightly colored (either yellow or green), and even the black varieties have a characteristic appearance, so that ore bodies are readily recognized if they outcrop. More often, however, they do not outcrop, and then the search for ore involves a careful study of the geological conditions.

In vein deposits, such as those in Cornwall or Czechoslovakia, the problem of finding ore may be somewhat simpler than it is in the patchy deposits of carnotite in the United States.

In vein deposits there are ordinarily local differentiations in the appearance or the associations of the minerals in the vein filling that, properly interpreted, may lead to the discovery of ore shoots with a minimum of "dead work" underground.

There are certain indications for carnotite, but no rule in prospecting can be given, except that good judgment might be shown in choosing a favorable location. The erratic nature of the occurrences is indicated by the fact that an average of 14 per cent of the total time spent on working the claims operated by the Bureau of Mines in 1924 and 1925 was spent in searching for ore.

In prospecting and in delimiting ore bodies, after they are discovered, all the usual methods may be employed—test pits, tunnels, core drills, and churn drills. Even core drilling, however, is uncertain unless the holes are closely spaced, for there is usually little continuity to the deposits.

The Counter Is a Simple Instrument

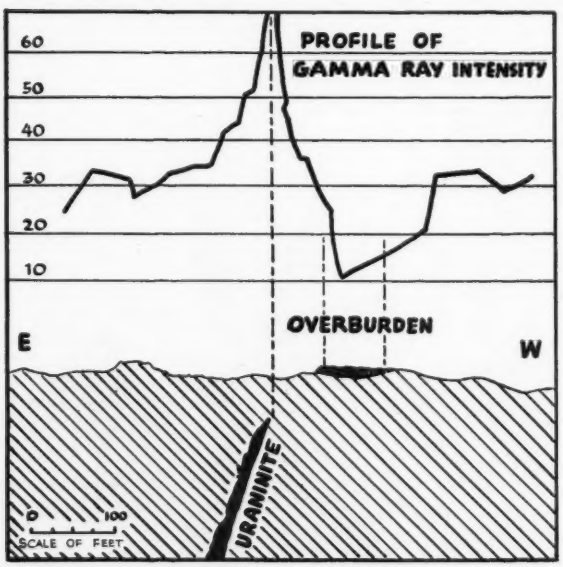
Under ordinary conditions gases are nonconductive to electricity. But when radioactive radiations pass through a gas they cause ionization, a process whereby the molecules of the gas acquire an electric charge and the gas becomes electrically conducting. Thus, in a simple gold-leaf electroscope, the charged leaves stand apart by repulsion and remain in that condition due to the insulating properties of the surrounding air. When a radioactive substance is brought near the charged leaves the air becomes ionized, allowing the charge on the leaves to leak off, causing the leaves to collapse.

Or, if two plates are arranged in a gas, and an electric potential applied to them, the gas separating the plates will under ordinary conditions prevent the charge from leaking off the plates. If, however, a high-speed electron passes through the gas between the charged plates, the gas will become ionized and permit the passage of electricity. If the potential between the plates is large, then the arrangement serves to magnify the effects of the electron passing through the gas, and a sensitive instrument can be used to detect leakage between the plates.

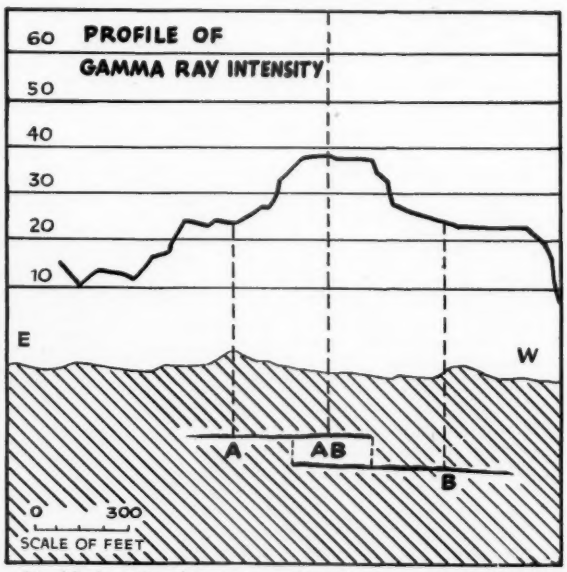
This rather approximately describes the essential parts of the extraordinary instrument now called the Geiger-Mueller counter, or plainly designated as "counter." Back in 1908, Rutherford and Geiger made a historic experiment that was to lay the foundation for advancement in this field; since, counters of numerous designs and sizes have been developed for investigating radioactivity.

Originally, the arrangement consisted of a cylinder and an axial wire, with a potential difference applied to

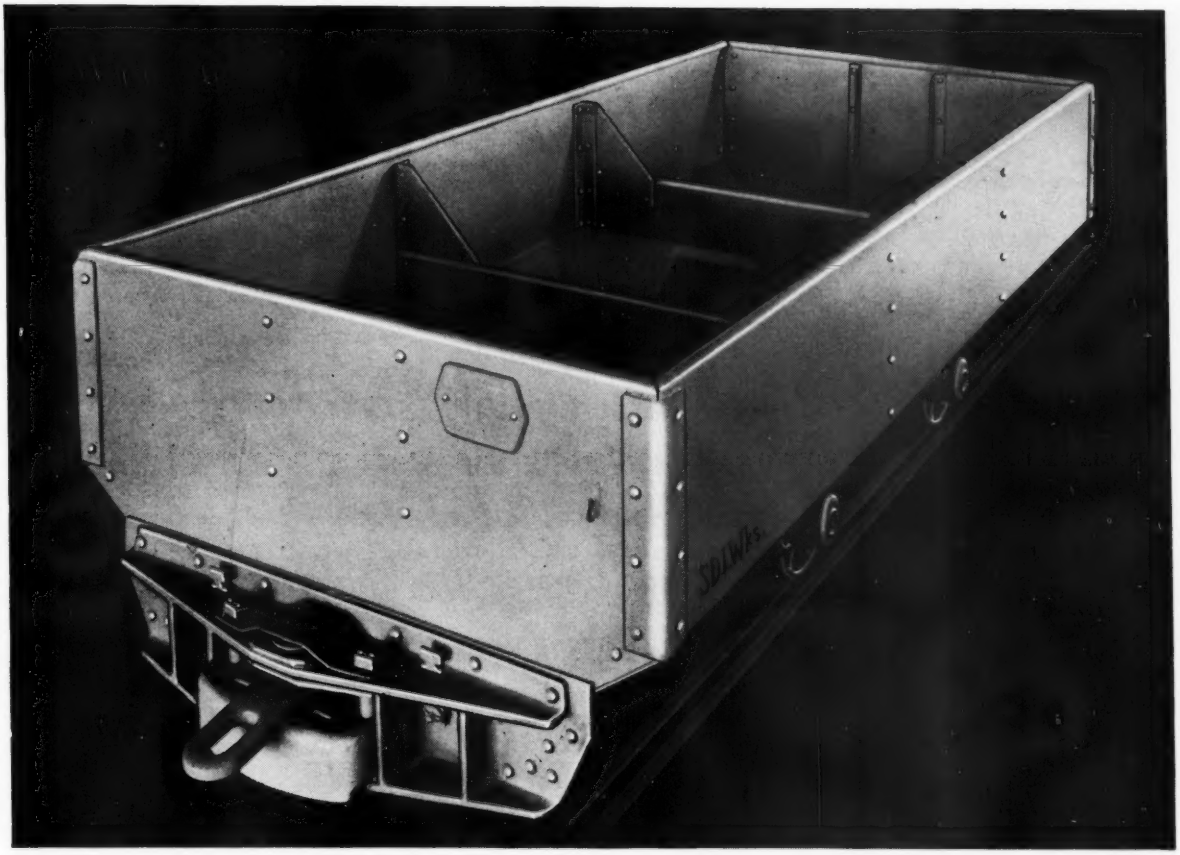
(*Continued on page* 37)



Profile of gamma ray intensities over uraninite, shown in black as a shear zone, with bedrock (diagonal) surrounding it. The overburden area near the shear zone and its effect on the gamma ray intensity, is evident at the points of the curve (modified after Ridland), where Geiger counts were taken



Simplified profile of gamma ray intensities over a horizontal zone of radioactive minerals (like carnotite or uraninite alteration products) which may be present in certain sedimentary beds. The radioactive layers A and B are overlapping at AB. Curve may be taken to represent either the overlapping or a zone AB filled with radioactive material



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Technical data on Dutch State Mines Processes and Apparatus have been transmitted to the American Cyanamid Company.

The Cyanamid Mineral Dressing Laboratory at Stamford, Connecticut, U.S.A. is now equipped to make large-scale, continuous tests using the Dutch State Mines Cyclone. Technical descriptions of this apparatus and its performance are to be found in *Mining and Metallurgy, December, 1946; Coal Technology, February, 1947, and Coal Technology, August, 1947.*

Mineral and coal producers interested in securing additional information on Dutch State Mines Processes and Apparatus, or in having testing work initiated, should correspond with

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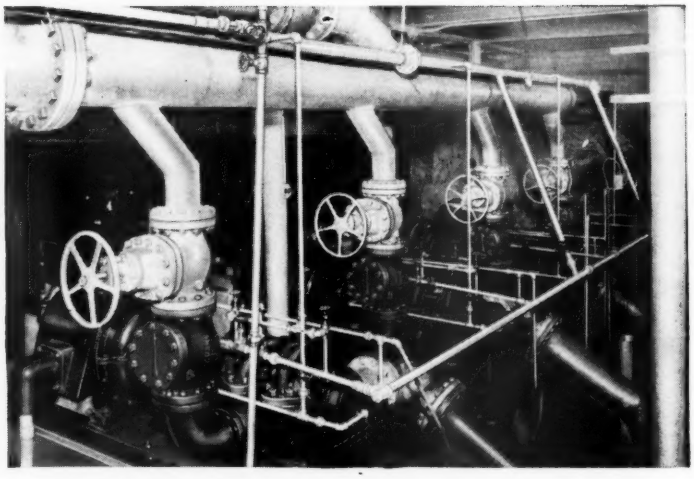

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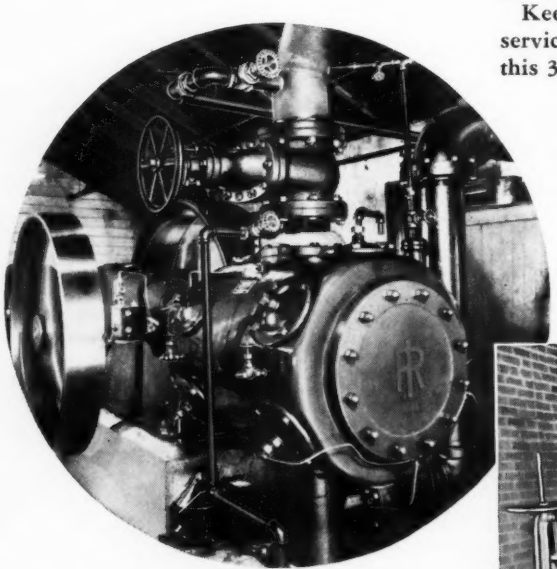

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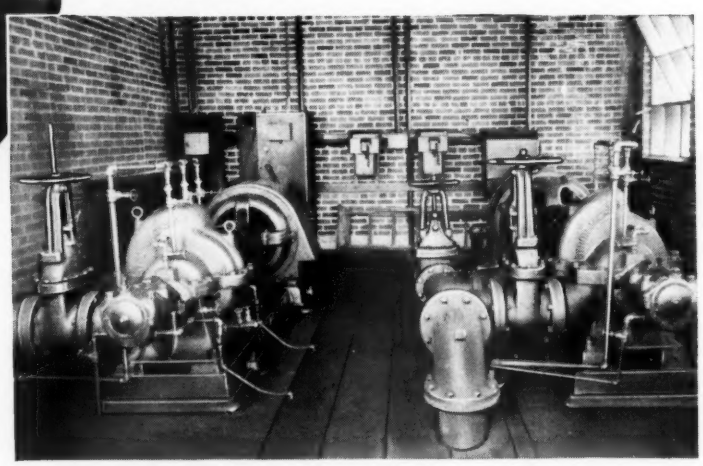

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Prospecting with the Geiger Counter

(*Continued from page* 32)

them. Upon the passage of particles through the air separating the cylinder and wire, "the current through the gas due to the entrance of an alpha particle into the detecting vessel was magnified . . . sufficiently to give a marked deflection to the needle of an electrometer of moderate sensibility."

At the present time, very elaborate counters have been devised. Some of these are suited to the study of radiations like cosmic rays. Others are intended for the measurement of intensely active radioactive substances, scaled to respond only to every 8th, 16th, 32nd, or 64th or even higher numbered particle which passes through the instrument. Still other counters are specially built to measure X-rays, ultra-violet light, neutrons, or other particles.

The counter is now indispensable in the study of radioactivity, nuclear physics and atomic energy. In a large degree, the success of the atomic bomb was assured by the counter.

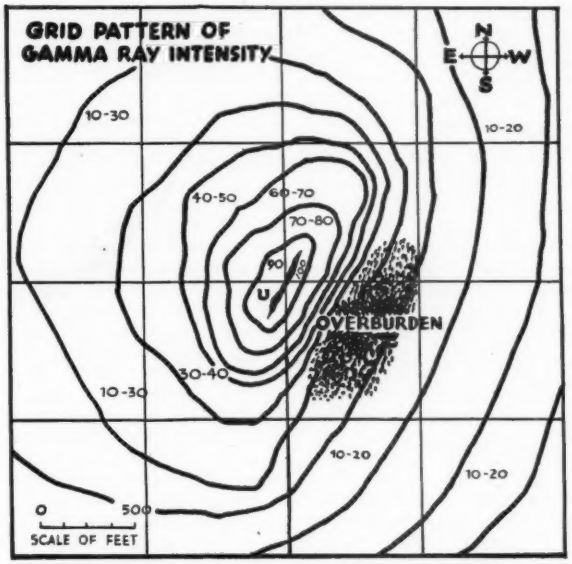
Counters may be constructed with a great variety of characteristics. The glass or metal tube or envelope within which the cylinder (anode) and wire (cathode) are assembled, called the "*counter tube*," may range between well over a yard in length down to a half an inch or less.

Counters Are Not Bulky

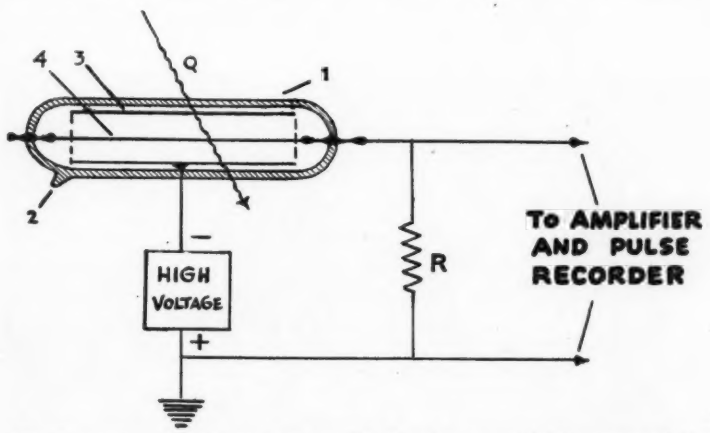
The high potential supply and the recording means in circuit with the counter tube may also range between wide limits. For field use, a complete counter unit may weigh only a few pounds, having headphones through which are heard "clicks" which correspond to a particle passing through the tube. In the research laboratory large oscilloscopes may be part of the counter set-up, permitting visualization and measurement of the energy of particles passing through the tube. Or, mechanical clocks or other automatic recording instruments may register the results of counter operation.

Since the counter is a very sensitive instrument, it responds to cosmic rays in the absence of radioactive materials. In the usual design of the counter, the effect of these cosmic rays is to produce what is known as the "background count", corresponding to the natural leak of an electroscope. This background count is a characteristic of the tube and the circuit; for example, a counter tube one-half inch in diameter and one-half inch in length has a background count of about 4 per minute, while one measuring 2 inches in diameter and 20 inches in length has a background of about 500 per minute.

Early in World War II the use of the Geiger counter for geological work was rather limited and considered new. At that time the field set available weighed about 40 pounds, and when this set was first taken into the field, the geologists were apparently equally skilled as psychologists, since they took along a physicist to operate the instrument. After the perspiring physicist had carried for days the 40-pound set over windfalls on trails, through swamp and up steep hills, he returned to his laboratory with the unquenchable resolve to build a much lighter set. Through his efforts, and those of other physicists, the present day instrument weighs less than two pounds. It can easily be carried in the coat pocket, and is not much larger than a small camera.



A contour plan of gamma ray intensities constructed from a series of sections as illustrated at the foot of page 32. Note how contours trend parallel to the strike of the uraninite zone. The spacing of the gamma intensity contours is influenced by the area of overburden and may also reflect the dip of the deposit. The numerals represent count values connected by contour lines



The Components of a Geiger Counter: (1) The glass or metal tube evacuated to low pressure, (2) sealed point of tube, (3) the cathode is usually a sheet of copper, (4) an axial wire serves as the anode. A high resistance R is placed between the Geiger tube (which is coupled to its high voltage supply) and the amplifying and recording system. The passage of a penetration ray or particle Q through the tube initiates an ionization click which is picked up by the amplifier

Geiger Field Unit

A description of a portable Geiger field counter, an example of several available on the market today, will perhaps make clear the nature and characteristics of these instruments to those who are unacquainted with them.

A modern portable field set is completely battery operated, compact and light in weight. The Geiger tube is often housed in a probing unit at the end of a cable which leads to the power source, generally contained in a small metal box which is carried over the shoulder for field work. In some cases the entire unit is placed within a single box. One advantage of having the probing unit on the end of a cable several feet long is that confined spaces, crevices and the like may be probed for radioactivity.

Usually, the field set is provided with headphones, and detection and measurement are obtained by counting the number of clicks that are heard. Rays passing through the Geiger tube initiate an ionization event and this in turn causes the tube to produce an electrical impulse, heard as a click in the headphones.

In some models a small neon lamp flashes whenever a ray passes through the tube. In others, where higher activities are to be measured, an electromechanical clock permits rapid and accurate counting of the pulses.

When no source of radiation is present, random clicks or counts are heard in the headphones or are registered by the clock. These are due to cosmic rays and to the natural radioactivity of the surroundings, and must be subtracted from the value obtained with a rock specimen or other material being tested for radioactivity.

If a minute quantity of radium or a small lump of pitchblende is brought near the counter tube, the rate of clicks heard in the head phones will immediately increase. The rate of these clicks is in proportion to the activity or to the intensity of the radiation passing through the tube.

The sensitivity of the Geiger unit varies with the design and construction. Sensitivity values are usually provided by the manufacturer of the instrument. One model will detect 1 milligram of radium at a distance of 20 ft., and can be used for locating radioactive rocks with as low as 0.00002 milligram radium equivalent.

Use in the Field

For prospecting work the table counter can be taken directly into the field. In surveying a locality for radioactivity it is the practice to measure the radioactivity intensity of the area at selected sites, using a grid-map of the terrain. Specimens of rock can be also carried into the camp or laboratory for determination, avoiding the burden of carrying the instrument into the field.

It is of special importance to recognize that a positive test for radioactivity does not necessarily mean the presence of uranium and radium. Every gamma ray-emitting substance is capable of producing a response in the counter devised for general work, so radioactivity may mean thorium and mesothorium instead of uranium (and radium).

In using the portable counter in the field, the probe unit which contains the Geiger tube, is placed undisturbed on the ground. The average number of clicks per minute, taken from a 5 or 10 minute reading, is then ascertained after subtracting the known background count established in a like manner. In surveying an area, systematic observations may be made every 20 to 30 yards or more, with careful counts for each site measured. Stakes can be driven into the ground for identification, and the value recorded on a map of the area. This permits identity of the exact spot at any later time. After a sufficient number of readings have been made, contour lines are drawn on the map, corresponding to equivalent radioactivity values. From this a good idea is often obtained as to the distribution of areas of more intense radiactivity. Likewise, when consistently high values are noted, the approximate configuration of the radioactive body may be determined.

Equipment and Method

An example of how the field counter is actually used is given in the Ridland investigation of the Great Bear Lake region in the Northwest Territory of Canada. The counter was carried on the back, lashed to a packboard (with modern counters this is not now necessary). The operator wears headphones, and listens to the clicks or reports as he walks from one position or "Geiger Station" to another.

In addition to the counter, he carries a bag which contains a stopwatch, a small ax, a pencil, a notebook, a heavy marking pencil, and small wood sticks which are used to support the instrument when it is placed upon the ground.

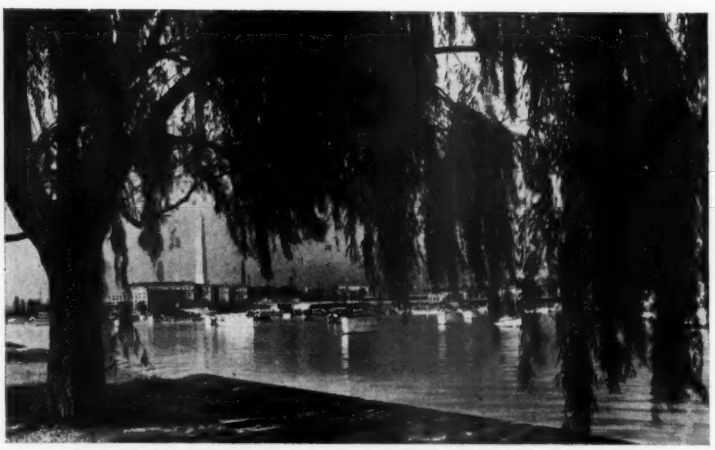
The day's survey is planned in advance from the geology and topography of the region. Count stations were taken at Contact Lake, N.W.T., along the traverse at intervals of from 50 to 150 ft. This, however, is not necessary in every instance, for there are occasions when the place can be chosen from a rapid discharge rate, or at places where the geology changes to a fault zone, shear zone, or mineralized zone.

In any event, when a station is reached, the instrument is layed out for a count, and as the count is taken an identification number assigned to the station. A stake is then driven into the ground and marked with the number. Later, each station is relocated by plane-table transverse and tied into a transit base loop.

Test drillings often reveal subsurface deposits of radioactive minerals, and these may be made in the course of search for other minerals, including petroleum, without undue labor and time consumption. The drill core is laid out and gamma ray intensity measurements made at intervals, the values being recorded on a log known as a "radiolog." Often an anomalous rise in gamma activity will be noted when the drill has passed near radioactive deposits or regions of mineralization, but, in general, when the bit approaches a formation of say uraninite the values will rise quickly, reaching a peak when the actual radioactive material is entered.

References

De Ment, J., and Dake, H. C., *Handbook of Uranium Minerals*, Portland, Oreg., The Mineralogist Publishing Co., 1947; Ridland, G. C., Use of the Geiger-Mueller counter in the search for pitchblende-bearing veins at Great Bear Lake, Canada, *Am. Inst. Min. Met. Eng. Tech. Pub. No.* 1614 (1943).



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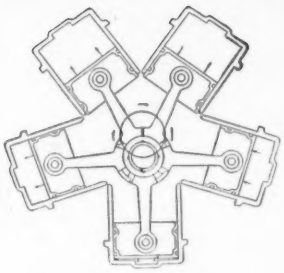

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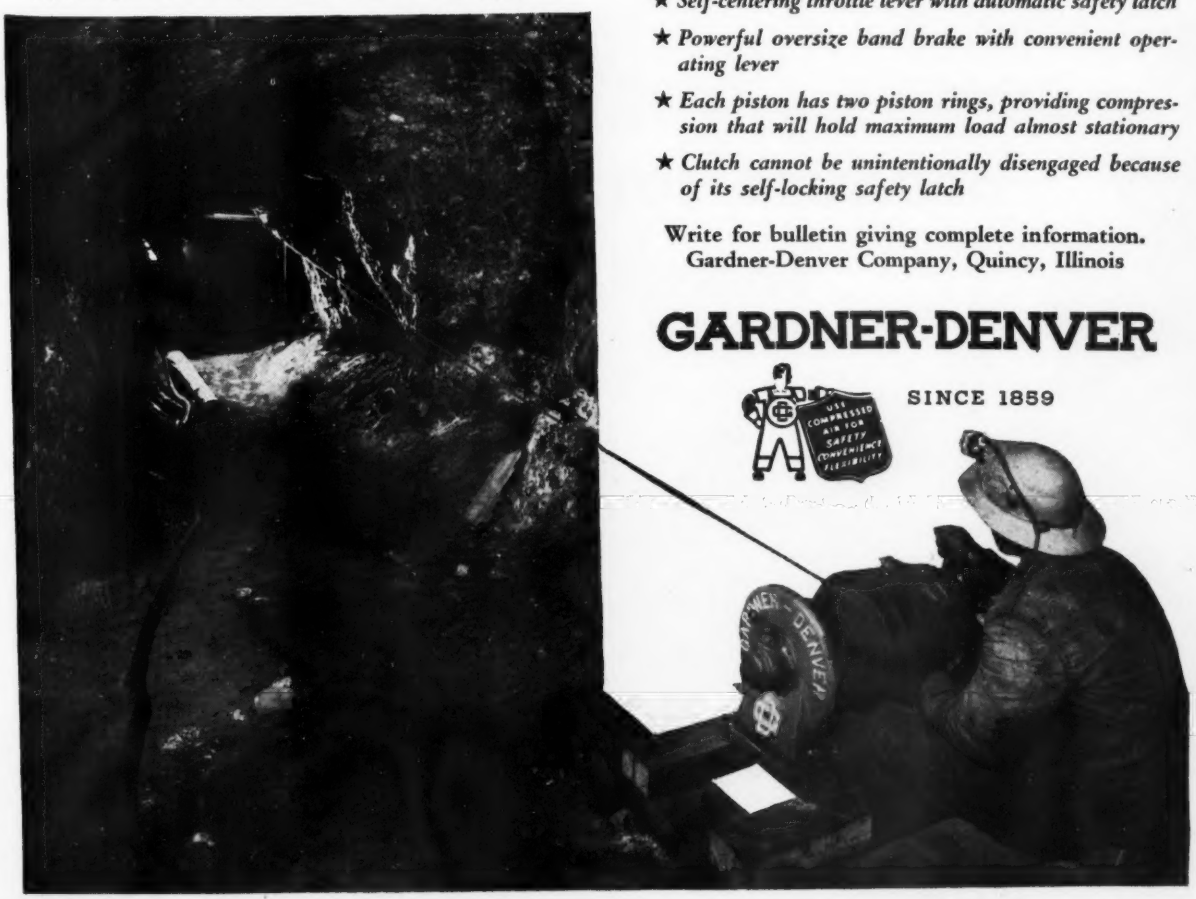

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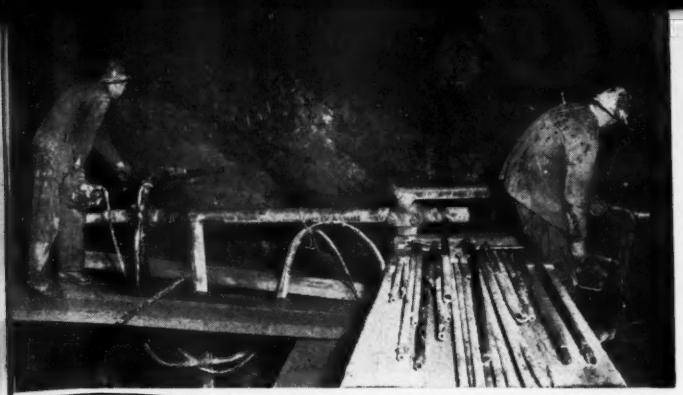

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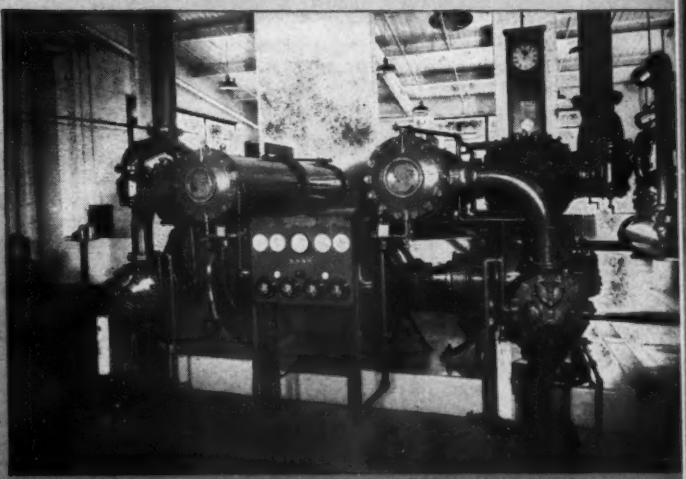

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Gasification of Coal Underground*

By LOUIS C. McCABE
Chief, Coal Division
U. S. Bureau of Mines

Can coal be burned successfully in place? What is the effect of such burning on the coal bed and the overlying strata? What is the quality of the gas produced? Last January an experiment was conducted at Gorgas, Ala., by the Aabama Power Company working jointly with the U. S. Bureau of Mines, to determine the answers to these questions. Preliminary data indicates that this means of gas production is expensive and that it probably would not be practical at this time for commercial purposes. However, as this method offers possibilities for the utilization of thin seams and those containing a high percentage of impurities, further experiments will be made in the near future. The Gorgas test was successful in that it demonstrated that usable gases can be produced underground; it further indicated that with greater pressures, the quality of the gases produced can be improved.

IN September, 1946, Dr. Milton H. Fies, Manager of Coal Operations, Alabama Power Company, proposed a cooperative agreement between the Bureau of Mines and his company to cover a limited experiment in the underground gasification of coal at Gorgas, Ala. It was our joint purpose to determine whether coal in place could be burned successfully and what effect the fire would have on the coal bed and the overlying strata. The production of a usable gas was to be undertaken in a later experiment after the first objectives were attained.

Under the cooperative agreement, the Alabama Power Company furnished the site, supplies, and labor for preparing and maintaining the workings. The Bureau provided technical direction, engineers to supervise the field work while the underground development was in progress, and instruments for collecting the operating data.

The Bureau of Mines has long been interested in the practical possibilities of producing gas by burning coal in the bed, particularly where there are abundant impurities or where the coal is thin. Successful commercial operation would open new sources of raw material for the manufacture of synthetic liquid fuels, industrial and domestic gas supply, and the chemical industries. Under certain conditions, successful generation of a lean gas might provide fuel for gas turbines generating electric power at the mine.

Earlier Work

The concept of burning coal in the ground to produce a usable gas is not new. In 1868, Sir William Siemens [1] suggested the gasification of slack and waste coal in the mine. The first suggestion that coal might be gasified in the bed is attributed by the Russians to Mendeleev [2] in 1888. In 1909, a British patent was granted to A. G. Betts [3] for a method of gasifying coal in the seam by starting fires at the base of one or more shafts or boreholes, supplying air and steam through a pipe and withdrawing the gas through the same or other shafts. Sir William Ramsey,[4] in 1912, suggested that "as deposits of salt were worked not by mining the salt, but by pumping in water which was recovered as brine, so it would be ideai, instead of mining coal, to have retorts in the bowels of the earth for the production of gas. A boring might be put down to the coal strata, the coal might be lighted where it was, and air and water might be passed down so as to produce carbon monoxide and hydrogen." Sir William Ramsey was instrumental in having a small shaft six feet in diameter, lined with reinforced concrete, sunk in the Durham field. This shaft was to have been connected in the coal seam to a drift a short distance away, but with the outbreak of the First World War and the death of Sir William shortly afterward, the work was not continued.

The Soviet Government subsidized some preliminary experiments in 1931. Two years later they formed a special trust (Podzemgas) to carry out experimental work with a view to establishing industrial plants. Podzemgas set up five experimental stations in the Lower Moscow, Donetz, Kuznetz (Eastern Siberia), and North Caucasus coal fields. Concurrently with the work of the experimental stations, theoretical and laboratory studies of the chemical and physical processes involved were carried out at the Moscow Academy of Sciences, the Donetz Institute of Coal Chemistry, and elsewhere.

At the beginning of the Third Five-Year Plan in October 1938, it was decided to build and put into operation a series of industrial stations for underground gasification in the Donetz coal basin, the Lower Moscow coal basin, and in eastern U. S. S. R., making use of the gas for power, chemical works, and domestic purposes.

Very little information is available on the construction stage of these large industrial undertakings, and there is no doubt that their development was seriously hampered by the war. It is reported that Gorlovka, in the Donetz basin, operated successfully, and one in the Moscow region is reported to have begun operation in November 1940. The largest industrial station (in the Donetz basin) was planned to produce 14 million cubic feet of gas per hour, equivalent to about a half-million tons of coal per year.

The Russians have experimented with a number of different methods

* Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior, Washington, D. C.

[1] Siemens, W.—Trans. Chem. Soc., 1868, 21, 279.

[2] Mendeleev, D. C., Severny Vestnik, 1888, No. 12, Sec. II, p. 26.

[3] Betts, A. G., Improved Process for Utilizing Unmined Coal, British Patent 21674, Sept. 22, 1909.

[4] Jolley, L. J., and Booth, N., The Underground Gasification of Coal, Fuel in Science and Practice, Vol. XXIV, No. 2.

of burning coal with air, or oxygen-enriched air, and air and steam to produce carbon monoxide and hydrogen. Some of the earlier workings required too much labor underground or were unsuccessful technically. The three methods used in recent projects are described by E. T. Wilkins [5] as follows:

(1) *Stream Method.*—This method has been applied successfully to coal seams which dip steeply, and Fig. 1 is a simplified version of the general layout. Two galleries, which may be about 60 yards long and 100 yards apart, follow the dip of the seam and are joined at their lower ends by a horizontal gallery A. These three galleries thus isolate the rectangular panel of coal which is to be gasified. Connections with the surface are made through shafts B and C.

The coal is ignited by lighting a fire in gallery A, and is supplied with air through shaft B. The resulting gases are withdrawn from C. As the coal surface of the gallery A burns away, the fire zone advances upward along the seam. The ash, with any of the roof that may fall, collects in the space below the fire zone. Thus, apparently, three difficulties are largely overcome; the burning coal face is kept free from accumulations of ash, the air flow is kept in the neighborhood of the burning coal, and falls of roof do not readily block the passage or engulf unburned coal.

This method, which was that used in a semi-industrial plant, has been the most successful so far, but suffers from the disadvantages that it is not applicable to other than steeply dipping seams and necessitates some preparatory hand working. Much effort has recently been put into attempts to eliminate hand working by cutting passages through the coal by means of high-pressure water, and by burning with a jet of oxygen, but no information is yet available as to whether these methods have been effective.

(2) *Percolation (or Filtration) Method.*—This method, which eliminates all underground labor, is intended for use with horizontal seams and is based on Betts' original British Patent. It depends on the development of shrinkage cracks and fissures in the coal when heated, so that part of the seam becomes readily permeable to gas. This condition is brought about by making borings from the surface, which are arranged, as shown in Fig. 2 (b), in concentric rings of 20-40 meters radius, or in other regular arrangements. Fig. 2 (a) illustrates the method of burning. The coal at the bottom of the central borehole (No. 1) is fired, and combustion is maintained by air or oxygen supplied through a central pipe A. Initially the products pass up the annulus and away via the valve B, but as the coal becomes heated and fissures form, it becomes possible to pass the gases through the seam to one of the boreholes (e.g., No. 2), in the first concentric ring, which has been fired in a similar manner. The flow is then as shown in Fig. 2. When the coal lying between these two holes has been gasified, hole No. 2 is closed and the next hole (e.g., No. 3) is brought into use, and so, it is claimed, the whole seam may be worked out.

A combination of the percolation and stream methods has also been proposed.

(3) *Borehole-Producer Method* — This is stated to be suitable for inclined or horizontal seams, especially when the roof is soft. Two parallel galleries are driven through the seam about 100 yards apart and joined at 5-yard intervals by boreholes 4 in. in diameter in the plane of the seam. These holes are sealed at the ends until required for gasification, and each is fired in turn by an electric device operated from above ground. Air is supplied through one gallery and the gas withdrawn from the other. As the coal burns away, the borehole enlarges until it becomes approximately the diameter of the seam. It is then abandoned and another started up, but it is not clear how air is prevented from bypassing through the burned-out boreholes.

This method apparently is only intended for use when other methods are unsuitable.

Table I analyzes a producer gas made by continuous blowing with air enriched with 27 to 30 per cent oxygen, a water gas generated by alternate 20-minute blasts of air and

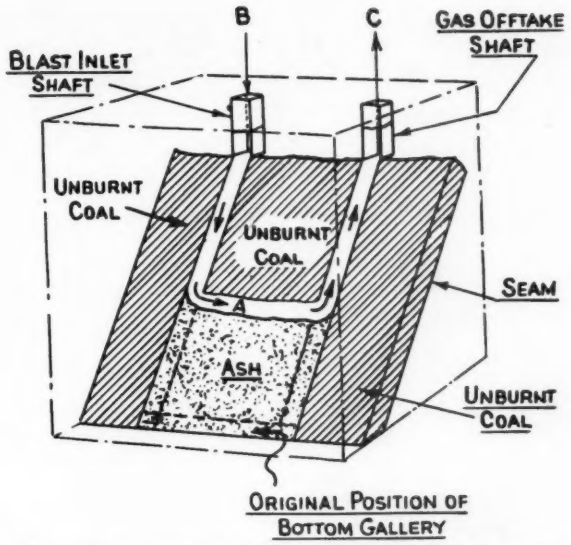


Fig. 1. Diagrammatic representation of the stream method—the most successful means for burning steeply dipping seams

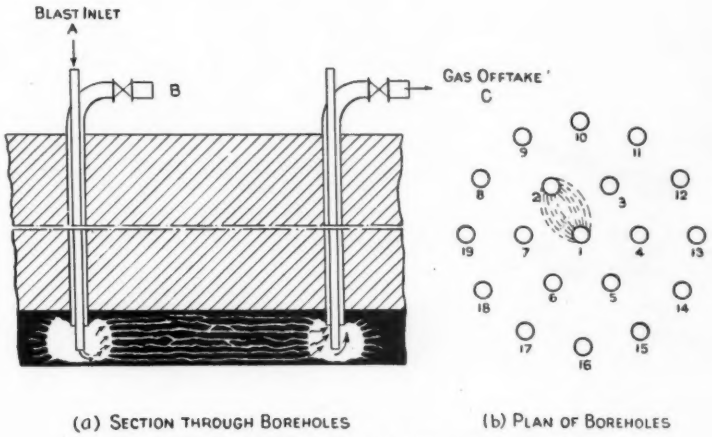


Fig. 2. The percolation method eliminates underground labor

[5] Wilkins, E. T., The Underground Gasification of Coal, Fuel Economy Review, 1944. Wilkins, E. T., Op. cit.

steam, and a hydrogen-rich gas. The last is produced as follows: Air is introduced at 3.5 atmospheres for four to six hours to yield a gas similar to (a); the air is then shut off for the same length of time and a gas having the analysis given in (c) is produced.

TABLE I

THREE TYPES OF GAS MADE BY UNDERGROUND GASIFICATION

	(a) Producer gas (%)	(b) Water gas (%)	(c) Hydrogen-rich gas (%)
CO_2	10– 12	21.9	20.3
CO	23– 27	15.0	11.7
H_2	12– 15	50.1	44.7
CH_4	2– 3	5.4	
N_2	43– 47	7.0	23.3
Calorific value (B.t.u./cu. ft.)	112–146	245	180 (calc.)

The Alabama Project

The site chosen for the initial experiment was on property of the Alabama Power Company adjacent to the power station at Gorgas, Ala. The area is an irregular hilltop, approximately 350 by 450 ft. in area, and is underlain by the Pratt coal bed (Figure 3).

The Pratt coal bed, which is essentially horizontal, is 35 in. in thickness and is here overlain by 25 to 35 ft. of clay shale and weathered sandstone. The coal is high-volatile A bituminous and has good coking quality. The average as-received proximate analysis of eight samples taken in the mine is as follows: Moisture, 4.2 per cent; fixed carbon, 51.0 per cent; volatile matter, 31.9 per cent; ash, 12.9 per cent; sulfur, 1.2 per cent, and B.t.u., 12,500.

As shown in Figure 3, the body of coal in which the experiment was carried out was isolated from adjacent coal acreage by making a 20-ft. cut through the overburden and removing the coal. This assured confinement of the fire to a limited area should it get out of control.

Two 6-ft. entries were driven from the cut for 143 ft. and 171 ft. respectively and connected at the inby ends by a crosscut. (Figure 3). The entries were driven on 46-ft. centers, leaving a pillar approximately 150 ft. long and 40 ft. wide. The entries were driven 6 ft. in width to facilitate development. They were then reduced by bagging with rock dust to a 2-ft. average cross section to increase the air velocity.

A concrete stopping was built 10 ft. inby in the portal of each entry. Each carried two 24-in. concrete pipes for air intakes and carrying the gas to stacks. The blower, which was a positive pressure type capable of delivering 7,350 cu. ft. of air per minute at a pressure of 2 lbs. per square inch when operated at 175 rpm, was connected by a "T" (Figure 4) to deliver air to either entry. In addition to the air line and stack line, each portal carried a 2-in. steam line.

Twenty churn-drill holes, five rows of four holes each on 10-ft. centers, were drilled from the surface through the coal bed in the area to be burned out and cased with 4-in. pipe (Figure 5). Screw caps, equipped with nipples for gas sampling and for the insertion of thermocouples, were placed on each of the casings.

Coal Ignited with Bomb

The coal was ignited on January 21, 1947, by dropping a thermite bomb through one of the drillholes into the crosscut into broken coal in which other bombs had been placed.

The air and gas flow was reversed periodically to burn the pillar uni-

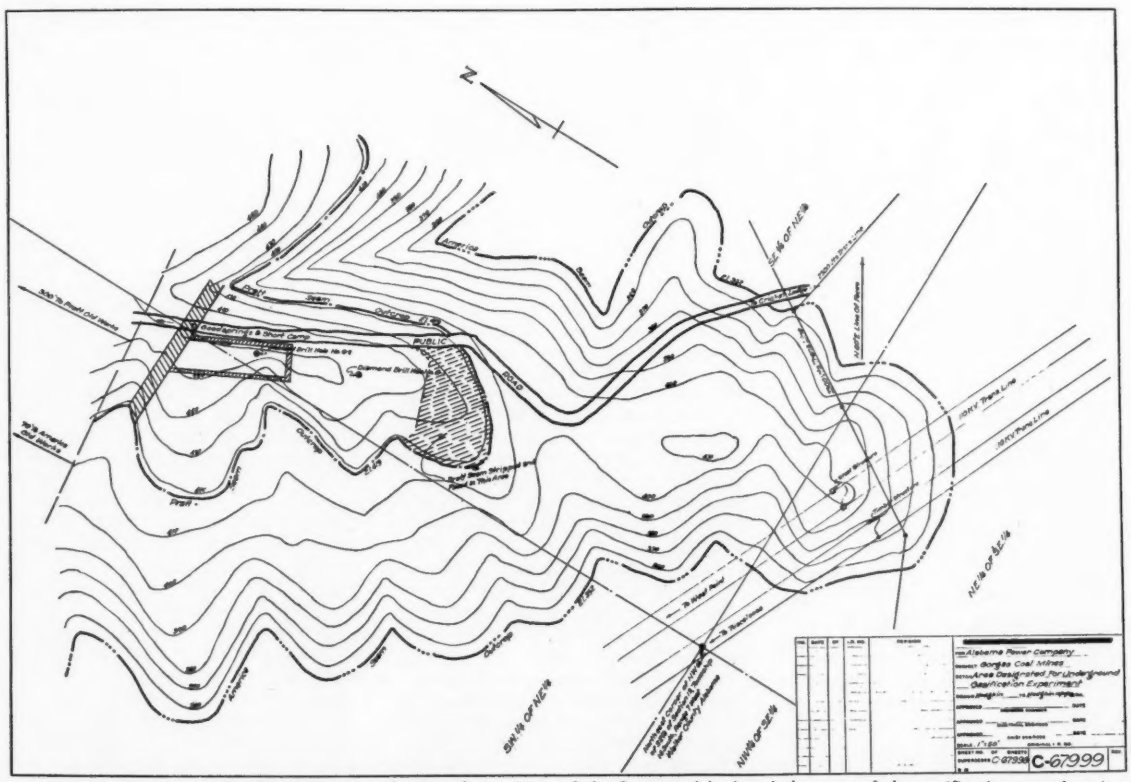


Fig. 4. A "T" connection for delivering air to one of the entries

formly. At different times, gas was produced with air, oxygen-enriched air, air-oxygen-steam, oxygen-steam, and steam alone. Heating values were lowest with air (av. 45.6 B.t.u. per cu. ft.) and highest during the steam runs when heating values were usually greater than 200 B.t.u. per cu. ft. The characteristics of the gases produced under the various conditions are fully described in a Bureau of Mines Report of Investigations by James J. Dowd, James L. Elder, and J. P. Clapp, entitled "Experiment in Underground Gasification of Coal, Gorgas, Alabama," which the Bureau of Mines will publish.

Combustion was easily maintained during the experiment, and the coal was completely burned as the fire advanced into new territory. It was difficult to confine the fire and gases in the small area and under the shallow overburden after the first month of operation, and on March 12, 1947, the mine was closed and combustion stopped. It is estimated that 236 tons of coal burned completely and 164 tons coked. Coke was found only where combustion was arrested. Under the heat of combustion the roof became plastic, expanded, and settled to the mine floor behind the burning coal face, providing a channel which kept the air flowing through the combustion zone.

This initial experiment gave more information than was anticipated when it was planned. It is now known that a coal bed can be completely burned under conditions such as were encountered at Gorgas; that roof falls from overburden of this kind cause no difficulty, and that the slagging of a clay shale roof may actually act to support the overlying strata and channel the air against the burning face. It was demonstrated that a usable gas can be produced underground, and it is indicated that with greater pressures and velocities the quality of the gas may be improved.

Plans for further work have not been completed, but the data obtained in the experiment briefly described here suggest that the cost of developing and operating an underground gasification project should be critically examined. If cost estimates now in preparation indicate that a million b.t.u. can be produced and transported to the point of consumption cheaper by underground gasification than by mining and transporting coal in lump form, further work to prove this assumption is justified. The system of preparing underground workings used in the first experiment at Gorgas served very well as a test installation, but is expensive to develop and maintain and would not be considered for a commercial installation. A system similar to the percolation method (Figure 2), under 200 or 300 ft. of cover, probably would give the lowest development and operating costs in a horizontal coal bed.

Fig. 5. Twenty churn drill holes were sunk for gas and heat sampling

Committee Outlines El Paso Program

Salt Lake City Meeting Formulates Plans for Metal Mining Convention in October

AT Salt Lake City on July 15, the Program Committee for the 1947 Metal Mining Convention of the American Mining Congress met to formulate plans for the October 27-29 gathering at El Paso. The committee meeting, which lasted all day, was called to order by Donald H. McLaughlin, president, Homestake Mining Company, and national chairman of the Program Committee, in the offices of the late Samuel Newhouse, located on the top floor of the Newhouse Building, where a beautifully furnished board room overlooks the town and the surrounding mountains.

As planned by the committee, five general sessions of the convention will be devoted to important industry problems in the fields of manpower, labor relations, labor legislation, mechanization, ore reserves, incentives needed to encourage exploration and development, taxation, safety, public land problems, and the future outlook for the metals. Emphasis will be placed upon how the mines can overcome the problems of high wage costs and shortage of skilled manpower. Recognizing the importance of a productive domestic mining industry to the future prosperity and security of the nation, speakers will discuss the governmental policies called for to permit efficient operation and to encourage the development of new ore reserves.

Special sessions will also be devoted to improvements in operating practice at mines and mills—mechanization of underground operations for greater productivity, lower costs, and reduced labor turnover; new drilling methods; improved stoping practices; developments in open-pit mining; and improvements in milling to permit utilization of lower grade materials, thus adding to available ore reserves.

One full session will probably be devoted to present-day mining activities and conditions in Mexico, with distinguished speakers from our sister republic south of the Rio Grande.

Entertainment plans for the visiting mining men and their ladies are being made by an enthusiastic corps of committees appointed by the El Paso Chamber of Commerce, whose "International Mining Days" Celebration serves as host to the meeting. These arrangements are in charge of E. McL. Tittmann, manager of the El Paso smelter of the American Smelting and Refining Company, as general chairman. Evening parties and special daytime events for the ladies will assure all who attend a most enjoyable visit. One evening will be left open for friendly gatherings and visits across the border to Juarez, famous for its food and hospitality and its colorful night life.

Registration and all convention sessions will be held in the Scottish Rite Auditorium. This building is located only a few blocks from the hotels and has excellent facilities for meeting purposes.

The El Paso Chamber of Commerce has reserved a "stockpile" of 600 rooms at various hotels and nearby auto courts. Hotel reservations are being handled by the Chamber's Mining Committee and those who plan to attend should make immediate reservations.

Seated (left to right): E. S. McGlone, Anaconda Copper Mining Co.; Tom Lyon, International Smelting & Refining Co.; Julian D. Conover, American Mining Congress; Donald H. McLaughlin (Chairman of Program Committee), Homestake Mining Co.; Paul H. Hunt, Park-Utah Consolidated Mines Co.; B. T. Poxson, Emperius Mining Co. Standing (left to right): M. R. Rosenblatt, Eimco Corp.; Roy A. Hardy, Getchell Mine, Inc.; Burt B. Brewster, Mining and Contracting Review; E. H. Snyder, Combined Metals Reduction Co.; Paul J. Sirkegian, Consolidated Coppermines Corp.; Wm. J. O'Connor, Utah Dept., American Smelting and Refining Co.; Verne D. Johnston, Oglebay Norton & Co.; O. W. Bilharz, Bilharz Mining Co.; James Ivers, Silver King Coalition Mines Co.; Gordon I. Gould, H. W. Gould & Co.; S. H. Williston, Cordero Mining Co.; James Wade, Tintic Standard Mining Co.; J. W. Feiss, Mining Congress Journal; J. K. Richardson, Utah Mining Association.

Coal Mine Haulage

THIS IS A COAL DIVISION REPORT

A Joint Report of the Conveyor and the Haulage Roads Committees, Showing Methods for Estimating Costs of Installing and Operating Main Line Haulages with Tracks and Belt Conveyors.

By A. E. LONG
Chairman
Subcommittee on Belt Conveyors
and
E. H. JENKS
Chairman
Subcommittee on Mine Tracks

THE design of a coal mine haulage system is no longer a simple matter of specifying the capacity of the mine cars and the size of the locomotives; the operator today first has to decide what type of equipment will best suit his conditions—whether track or belt haulage. The decision is not always easy, as there is quite a wide range of seam conditions where each type of equipment appears to offer equal advantages; this competitive field is considered in this report to be where the seam has grades of not more than 4 per cent and where the length of haul is between one and four miles. In presenting the figures it should be made clear that it is not the intent of the committee to say that this report gives the final answers; the figures are based on assumed specifications and their purpose is solely to show methods of estimating costs for installing, operating and maintaining each type of equipment under certain sets of mining conditions.

In order to show the effect of length and grade, both reports cover nine sets of conditions; haulage lengths of one mile, two miles and four miles, each with level grades, 2 per cent grades and 4 per cent grades. Certain other specifications apply:

(1) Each report is to cover main line haulage only.
(2) Each system is to operate two 8-hour shifts at 1200 tons output, producing 2400 tons per day for 250 working days per year, or 600,000 tons per year.
(3) The capacity is to be 150 tons per hour but each system is to be capable of handling peak loads of 150 per cent of rated

Total Costs Taken from Tables on Following Pages

UNDERGROUND TRACK AND MINE CAR MAIN LINE HAULAGE
ESTIMATED COST FOR INSTALLATION, MAINTENANCE AND OPERATION

	One Mile			Two Miles			Four Miles		
	Level	2%	4%	Level	2%	4%	Level	2%	4%
Equipment cost per ton—									
Track, trolley and feeders.	.0067	.0067	.0067	.0120	.0120	.0120	.0217	.0217	.0217
Rolling stock	.0260	.0260	.0260	.0283	.0283	.0283	.0295	.0295	.0295
Labor costs per ton—									
Installation	.0046	.0046	.0046	.0089	.0089	.0089	.0173	.0173	.0173
Maintenance and operation	.0133	.0133	.0133	.0433	.0433	.0433	.0433	.0433	.0433
Power cost per ton.....	.0026	.0063	.0114	.0050	.0136	.0232	.0099	.0272	.0463
Total cost per ton.....	.0531	.0574	.0622	.0975	.1061	.1157	.1217	.1390	.1581
Total cost per ton-mile..	.0531	.0574	.0622	.0487	.0530	.0578	.0304	.0347	.0395

UNDERGROUND BELT CONVEYOR MAIN LINE HAULAGE
ESTIMATED COST FOR INSTALLATION, MAINTENANCE AND OPERATION

	One Mile			Two Miles			Four Miles		
	Level	2%	4%	Level	2%	4%	Level	2%	4%
Equipment cost per ton—									
Depreciation at 10%.....	.0208	.0216	.0235	.0386	.0413	.0425	.0802	.0822	.0917
Interest at 3%.....	.0063	.0065	.0070	.0116	.0124	.0128	.0241	.0247	.0275
Supplies (10%)	.0021	.0022	.0024	.0039	.0041	.0042	.0080	.0082	.0092
Power	.0106	.0133	.0160	.0213	.0320	.0400	.0415	.0480	.0640
Installation—labor	.0004	.0004	.0004	.0009	.0009	.0009	.0016	.0016	.0017
Daily labor cost.....	.0133	.0133	.0133	.0167	.0167	.0167	.0267	.0267	.0267
Cost per ton.....	.0535	.0573	.0626	.0930	.1074	.1171	.1821	.1914	.2208
Cost per ton-mile.....	.0535	.0573	.0626	.0465	.0537	.0586	.0455	.0479	.0552

ESTIMATED COST OF MATERIALS FOR MAIN LINE TRACK AND WIRING

	Unit Cost	One Mile Units	One Mile Total Cost	Two Miles Units	Two Miles Total Cost	Four Miles Units	Four Miles Total Cost
60 lb. Track Materials							
Welded rails—tons	$67.87	95	$6,447.65	190	$12,895.30	380	$25,790.60
Bolted rails—tons	67.87	50	3,393.50	75	5,090.25	100	6,787.00
Angle bars—pair	2.00	190	380.00	285	570.00	380	760.00
Treated ties	1.50	3,050	4,575.00	6,100	9,150.00	12,200	18,300.00
Untreated ties	.79	1,600	1,264.00	2,400	1,896.00	3,200	2,528.00
Spikes—kegs	8.50	35	297.50	65	552.50	120	1,020.00
Track bolts—kegs	14.43	3	43.29	4½	64.93	6	86.58
Rail bonds—4/0	2.20	190	383.80	280	616.00	370	814.00
Slag ballast—tons	1.75	880	1,540.00	1,760	3,080.00	3,520	6,160.00
Welding materials—jts.	3.76	352	1,323.52	704	2,647.04	1,408	5,294.08
Turnouts	177.26	16	2,836.16	18	3,190.68	20	3,545.20
Switch tie sets	44.16	16	706.56	18	794.88	20	883.20
Cross bonds—4/0	2.24	13	29.12	20	44.80	25	56.00
Total track material			$23,220.10		$40,592.38		$72,024.66
Trolly and Feed Wire							
Trolley wire—lbs.	$.31	10,100	$3,131.00	18,400	$5,704.00	33,300	$10,323.00
Feeder line—lbs.	.31	8,200	2,542.00	16,400	5,084.00	32,800	10,168.00
Dual clamps	1.48	140	1,539.20	280	3,078.40	560	6,156.80
Single clamps	.59	90	53.10	180	106.20	360	212.40
Mine hangars	.68	340	231.20	630	428.40	1,140	775.20
Expansion bolts	.41	340	139.40	630	258.30	1,140	467.40
Feeder splicers	4.37	3	13.11	7	30.59	14	61.18
Trolley splicers	2.11	6	12.66	12	25.32	23	48.53
Section switches	20.33	4	81.32	4	81.32	4	81.32
Total wire material			$7,742.99		$14,796.53		$28,293.83
Total track and wire			$30,963.09		$55,388.91		$100,318.49
Depreciation at 10%			3,096.31		5,538.89		10,031.85
Interest @ 3%			928.93		1,661.67		3,009.55
Investment cost per ton @ 600,000 tons per year			$0.0067		$0.0120		$0.0217

ESTIMATING LABOR FOR INSTALLING AND REMOVING TRACK & WIRE

COST PER TON IS BASED ON 10 YEARS PRODUCTION OF 6,000,000 TONS

	Unit Cost	One Mile Units	One Mile Total Cost	Two Miles Units	Two Miles Total Cost	Four Miles Units	Four Miles Total Cost
Welded track	$3.00	5,280′	$15,840.00	10,560′	$31,680.00	21,120′	$63,360.00
Bolted track	2.77	2,790′	7,728.30	4,175′	11,564.75	8,350′	23,129.50
Turnouts	147.50	20	2,950.00	39	5,752.50	58	8,555.00
Trolley	.177	5,280′	934.56	10,560′	1,869.12	21,120′	3,738.24
Feeder	.177	5,280′	934.56	10,560′	1,869.12	21,120′	3,738.24
Sidetrack trolley	.177	2,790′	493.83	4,175′	738.97	8,350′	1,477.95
Totals			$28,881.25		$53,474.46		$103,998.93
Cost per ton			.0046		.0089		.0173

capacity, or 225 tons per hour. Coal is to be hauled on two shifts.

(4) Power at 250 VDC is estimated at 2 c. per kwh but no consideration is given to the cost of installing conversion units as it is agreed that both types of haulage will require the same sub-station capacity.

(5) All equipment is to be depreciated on a 10 per cent basis with interest charges at 3 per cent. Labor cost is to be $1.00 per hour; equipment and material costs are as of March 31, 1947.

ESTIMATED DAILY LABOR FOR TRACK HAULAGE, MAINTENANCE AND OPERATION

BASED ON A PRODUCTION OF 2,400 TONS PER DAY

	One Mile Number Men	One Mile Labor Cost	Two Miles Number Men	Two Miles Labor Cost	Four Miles Number Men	Four Miles Labor Cost
Dispatchers	..	....	2	$16.00	2	$16.00
Main line motormen	2	$16.00	4	32.00	4	32.00
Switching motormen	..	....	2	16.00	2	16.00
Switching brakemen	..	....	2	16.00	2	16.00
Equipment maintenance	1	8.00	1	8.00	1	8.00
Track-wire maintenance	1	8.00	2	16.00	2	16.00
Total per day		$32.00		$104.00		$104.00
Cost per ton		.0133		.0433		.0433

Track Haulage

The main line consists of a single track but with adequate side tracks laid in the parallel entry. It is assumed that room entries are turned to the right and left on 600 ft. centers with rooms worked off both sides; switches are included for main line at these intervals for the first mile. The track is laid with 60 lb. rail on 5 in. x 7 in. ties with 9 in. of slag ballast. On the main entry the rail joints are welded and the ties are treated; on the side tracks, the joints are bolted and the ties are untreated. The trolley wire is No. 9 section with 500,000 CM feeder and similar construction methods and material for track wiring are used throughout both on the level and on the grades.

The same number of mine cars (110 at 6 tons capacity) are estimated for the one mile, two mile and four mile hauls. As explained by the committee, the time of the cars spent in transit is only a small proportion of the shift and the number of mine cars needed is determined by the tonnage produced during the shift. The committee further points out that one mile, two miles and four miles are arbitrary distances which do not necessarily mark economic limits for any mine car and locomotive system; this factor is further evidenced in the man hours estimated for the haulage operation where the number of men employed is the same for the two mile and four mile distances.

The power costs for track haulage are calculated as follows: A 15-ton locomotive with two 115-hp. motors and a speed of 9.4 miles per hour (0.106 hours per mile) has a power consumption of 230 hp × .746 × 0.106=18.4 kwh per mile. Adding 10 per cent acceleration loss and 25 per cent distribution loss, makes a total of 25.2 kwh per mile. Its haulage rating is 375 tons on level grade, 115 tons on 2 per cent grade and 63 tons on 4 per cent grade; assuming a mine car capacity of 7 tons and an empty weight of 3 tons, a locomotive trip would haul 262 tons of coal on a level grade, 80.5 tons on a 2 per cent grade and 44.1 tons on a 4 per cent grade.

Then, for example, on a 2 per cent grade the power used is $\frac{25.2 \text{ kwh}}{80.5 \text{ tons}}$ =0.313 kwh per ton-mile and at 2c per kwh, the haulage cost would be $.0063 per ton-mile. The same formula is used for calculating the cost on a 4 per cent grade, except that the tonnage hauled is 44.1. In both of these cases, there is no power

ESTIMATED COST OF TRACK HAULAGE EQUIPMENT

Cost Per Ton is Based on Production of 600,000 Tons Per Year

	One Mile	Two Miles	Four Miles
Mine cars—110	$93,500	$93,500	$93,500
10-ton locomotive	1 @ 10,580	2 @ 21,160	1 @ 10,580
15-ton locomotive	1 @ 16,080	1 @ 16,080	2 @ 32,160
Total investment	$120,160	$130,740	$136,240
Depreciation—10%	12,016	13,074	13,624
Interest—3%	3,605	3,922	4,087
Charges per year	$15,621	$16,996	$17,711
Cost per ton	0.0260	0.0283	0.0295

ESTIMATED POWER COST FOR TRACK HAULAGE

Based on Operating Locomotives With Power at 2 Cents Per KWH

	One mile	Two miles	Four miles
Level grade	$0.0026	$0.0050	$0.0099
2 per cent grade	0.0063	0.0136	0.0272
4 per cent grade	0.0114	0.0232	0.0463

ESTIMATED LABOR FOR INSTALLING BELT CONVEYOR

Cost Per Ton Based on a Labor Rate of $1 Per Man-Hour and 10 Years Production of 6,000,000 Tons

	Level Grade	2% Grade	4% Grade
One Mile Haul—			
Conveyor	2,000 man-hr.	2,000 man-hr.	2,000 man-hr.
Supply Track	422 man-hr.	422 man-hr.	422 man-hr.
Wiring	211 man-hr.	211 man-hr.	211 man-hr.
Cost Per Ton	$.0004	$.0004	$.0004
Two Mile Haul—			
Conveyor	4,000 man-hr.	4,000 man-hr.	4,000 man-hr.
Supply Track	844 man-hr.	844 man-hr.	844 man-hr.
Wiring	422 man-hr.	422 man-hr.	507 man-hr.
Cost Per Ton	$.0009	$.0009	$.0009
Four Mile Haul—			
Conveyor	8,000 man-hr.	8,000 man-hr.	8,000 man-hr.
Supply Track	1,688 man-hr.	1,688 man-hr.	1,688 man-hr.
Wiring	1,025 man-hr.	1,025 man-hr.	1,236 man-hr.
Cost Per Ton	$.0018	$.0018	$.0018

ESTIMATED COST OF EQUIPMENT FOR MAIN LINE BELT CONVEYOR AND SUPPLY TRACK

One Mile Haul—	Level Grade		2% Grade		4% Grade	
Belt conveyors	2@ 2,650′	$94,123.20	2@ 2,650′	$98,679.80	2@ 2,650′	$109,873.00
Belt motors	2@ 40 H.P.		2@ 50 H.P.		2@ 60 H.P.	
Supply haulage	Track-Equipment	30,936.47	Track-Equipment	30,936.47	Track-Equipment	30,936.47
Total Investment		125,059.67		129,616.27		140,809.47
Two Mile Haul—						
Belt conveyors	4@ 2,640′	191,500.00	4@ 2,640′	206,000.00	5@ 2,112′	212,000.00
Belt motors	4@ 40 H.P.		4@ 60 H.P.		5@ 60 H.P.	
Supply haulage	Track-Equipment	40,489.84	Track-Equipment	41,917.45	Track-Equipment	43,054.18
Total Investment		231,989.84		247,917.45		255,054.18
Four Mile Haul—						
Belt conveyors	7@ 3,017′	414,982.82	9@ 2,347′	427,135.59	12@ 1,760′	444,328.20
Belt motors	7@ 40 H.P.		9@ 40 H.P.		12 @ 40 H.P.	
Supply haulage	Track-Equipment	66,080.48	Track-Equipment	66,080.48	Track-Equipment	105,785.20
Total Investment		$481,063.30		$493,216.07		$550,113.40

ESTIMATED INVESTMENT COST FOR MAIN LINE BELT CONVEYOR HAULAGE BASED ON AN ANNUAL PRODUCTION OF 600,000 TONS

	Level Grade		2% Grade		4% Grade	
	Cost Per Year	Cost Per Ton	Cost Per Year	Cost Per Ton	Cost Per Year	Cost Per Ton
One Mile Haul—						
Depreciation @ 10%	$12,506.00	$.0208	$12,962.00	$.0216	$14,081.00	$.0235
Interest @ 3%	3,752.00	.0063	3,889.00	.0065	4,224.00	.0070
Supplies @ 1%	1,251.00	.0021	1,296.00	.0022	1,408.00	.0024
Total Investment		.0292		.0303		.0329
Two Mile Haul—						
Depreciation @ 10%	$23,199.00	$.0386	$24,792.00	$.0413	$25,505.00	$.0425
Interest @ 3%	6,960.00	.0116	7,438.00	.0124	7,652.00	.0128
Supplies @ 1%	2,320.00	.0039	2,479.00	.0041	2,550.00	.0042
Total Investment		.0541		.0578		.0595
Four Mile Haul—						
Depreciation @ 10%	$48,106.00	$.0802	$49,322.00	$.0822	$55,011.00	$.0917
Interest @ 3%	14,432.00	.0241	14,796.00	.0247	16,503.00	.0275
Supplies @ 1%	4,811.00	.0080	4,932.00	.0082	5,501.00	.0092
Total Investment		.1123		.1151		.1284

figured for the return trip as this would coast on the downgrade. For a level track, however, the return trip must be included, basing its weight on the empty mine cars, which would amount to 112.5 tons for the trip.

Conveyor Haulage

The conveyor is a 30 in. belt, operating at a capacity of 225 tons per hour. The lengths selected for the various grades and the horse power specified for each drive was considered by the committee as being ample to give the service desired, although it is recognized that some reductions in the size of the motors might be feasible.

The Committee

Invites Your Comment

Suggestions regarding any figures, methods of calculation or assumptions used in this report may be submitted to G. B. Southward, Mechanization Engineer, American Mining Congress, Washington 4, D. C.

The belt life of ten years may perhaps be subject to some criticism, but based on actual experiences, it is believed that with proper installation, belting should last for that length of time. By proper installation is meant that the splices would be vulcanized; that automatic switches would be provided to stop the motors automatically if the belt stops moving; and that the conveyor would not be operated in reverse to handle supplies. In line with this latter specification, the belt report includes estimates for a track haulage of 40 lb. rail paralleling the belt and equipped with locomotive and supply cars.

The conveyor is assumed to operate continuously 16 hours for a 2-shift day, and power is calculated on the basis of 75 per cent efficiency, by the following formula:

$$\frac{80 \text{ HP} \times .746}{75\% \text{ efficiency}} = 80 \text{ KW.}$$

The power cost is taken at 2c per KWH. and each belt is figured to operate continuously during the two shifts —16 hours per day.

ESTIMATED DAILY LABOR FOR BELT CONVEYOR MAINTENANCE AND OPERATION

COST PER TON BASED ON PRODUCTION OF 2,400 TONS PER DAY

	Number of Men	Man-Hrs. Worked	Labor Cost
One Mile Haul—			
Maintenance	2	16	$16.00
Supply Handling	2	16	16.00
Cost Per Ton			.0133
Two Mile Haul—			
Maintenance	3	24	24.00
Supply Handling	2	16	16.00
Cost Per Ton			.0167
Four Mile Haul—			
Maintenance	6	48	48.00
Supply Handling	2	16	16.00
Cost Per Ton			.0267

POWER COSTS FOR MAIN LINE BELT CONVEYORS

BASED ON 16 HOURS CONTINUOUS PER DAY AT 2c PER KWH

	Level Grade	2% Grade	4% Grade
One-Mile Haul			
Number of motors	2 @ 40 hp.	2 @ 50 hp.	2 @ 60 hp.
Power used per day	1,280 kwh.	1,600 kwh.	1,920 kwh.
Daily power cost	$25.60	$32.00	$38.40
Cost per ton	.0106	.0133	.0160
Two-Mile Haul			
Number of motors	4 @ 40 hp.	4 @ 60 hp.	5 @ 60 hp.
Power used per day	2,560 kwh.	3,840 kwh.	4,800 kwh.
Daily power cost	$51.20	$76.80	$96.00
Cost per ton	.0213	.0320	.0400
Three-Mile Haul			
Number of motors	7 @ 40 hp.	9 @ 40 hp.	12 @ 40 hp.
Power used per day	4,480 kwh.	5,760 kwh.	7,680 kwh.
Daily power cost	$89.60	$115.20	$153.60
Cost per ton	.0373	.0480	.0640

WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

ALTHOUGH the Congress did attain its objective and adjourn as of July 26, acrid debate over an election investigation kept the Senate in session until nearly 4:00 o'clock the next morning—the House had adjourned shortly after midnight. By resolution the second session of the 80th Congress will open on Tuesday, January 6, although House and Senate leaders may recall the Congress at any time before that date.

Outstanding in the legislation enacted in the first session are the Portal-to-Portal Act, Taft-Hartley Labor Act, the Presidential Succession Act, unification of the armed forces, and the implementation of foreign rehabilitation programs. Investigations to be conducted by Committees during the recess include those into living costs and prices, housing, farm problems, foreign and domestic trade, immigration policies, labor relations, and revision of the revenue laws.

Taxation

The Knutson Individual Income Tax Reduction bill, reintroduced following the President's veto of June 16, passed the House July 8 by a vote of 302 to 112 and the Senate on July 14 by a vote of 60 to 32. The measure was identical to that vetoed except that the effective date was January 1, 1948 instead of July 1, 1947. The White House promptly returned a second veto which the House overrode 299 to 108, but the Senate in its vote of 57 to 36 failed to override by five votes—thus all hopes of tax reduction at this session died.

Meanwhile, it has been announced that the House Committee on Ways and Means will continue the study of tax structure during the Congressional recess and will renew hearings beginning November 4, at which time the question of taxing cooperatives will receive first consideration.

Final outcome of Social Security payroll tax consideration is a continuation of the 1 per cent each on employers and employees until December 31, 1949. In the bill sent to the White House the rate increases to 1.5 per cent in 1950 and to 2 per cent in 1952 and thereafter. Meanwhile it is planned that the whole Social Security system will be subjected to study during the session next year.

Depletion—Non-metallics

The Knutson-Gearhart bill, which includes a reenactment of the 15 per cent depletion allowance for a number of non-metallic minerals and grants the allowance to several additional minerals, was approved by both Houses and now awaits the President's signature. The measure would now allow percentage depletion at 15 per cent of the gross income from the property, beginning December 31, 1946 for the following minerals: bauxite, fluorspar, flake graphite, vermiculite, beryl, feldspar, mica, talc (including pyrophyllite), lepidolite, spodumene, barite, ball, sagger and china clay, phosphate rock, rock asphalt, trona, bentonite, gilsonite, and thenardite. The House added bentonite, gilsonite and thenardite to the minerals granted percentage depletion in the 1942 and 1943 Revenue Acts, and changed the term "ball and sagger clay" to read "ball, sagger, and china clay." The Senate added bauxite, phosphate rock and trona and added a parenthesis "(including pyrophyllite)" after the mineral talc.

Coal Contracts

On July 8 operators representing over half of the tonnage of the bituminous coal industry signed a contract with the UMWA extending for one year from July 1, subject to termination at any time upon 30 days' written notice. The miners' representatives attempted to immunize the UMWA from the Taft-Hartley Act by including in the contract the statement that it covers the employment of persons in the bituminous mines "during such time as such persons are able and willing to work." The contract includes the following:

(1) Exempts supervisory employees, coal inspectors, weigh-bosses (where men are paid by the ton), watchmen, clerks, and engineering and technical forces of the operator from contract provisions. Provides for disputes arising as to these exemptions to be submitted to a Joint Board of Review consisting of two operators' representatives and two representatives of the Union.

(2) Incorporates the Federal Mine Safety Code into the agreement and provides that revisions can be made through joint consultation of operators, union and the U. S. Bureau of Mines. Establishes a Joint Industry Safety Committee composed of four members—two appointed by the Mine Workers and two by the operators, who will arbitrate appeals from re-

Washington Highlights

CONGRESS: Adjourned July 26 to return January 6.

TAX: Second veto kills individual tax cut.

SOCIAL SECURITY: Payroll tax remains at 1 per cent through 1949.

DEPLETION: Additional minerals get 15 per cent allowance.

COAL: Anthracite and bituminous wage agreements signed.

LABOR RELATIONS: Joint Congressional Committee to investigate.

COAL MINE INSPECTION: Federal inspectors to stress catastrophe hazards.

STREAM POLLUTION: Senate passes revised bill.

ST. LAWRENCE: Senate Committee approves project.

PREMIUM PRICES: Extended for two years.

FREIGHT RATES: ICC hearings on increases September 9.

commendations of Federal inspectors (based on "irreparable damage or great injustice"), and who will consult with the Bureau of Mines on revision of the Code. Establishes local Mine Safety Committees with authority to remove men from places where immediate danger exists, but with grievance machinery for removal of Committee members taking such action "arbitrarily and capriciously."

(3) Makes it mandatory that all mine operators signing the agreement provide the protection and coverage of Workmen's Compensation and Occupational Disease laws, whether compulsory or elective in the States in which the men are employed.

(4) Establishes a welfare fund levy of 10 cents per ton of coal produced for use or sale. Creates a three-man Board of Trustees to administer it, the Chairman to be UMWA President John L. Lewis, and the operator member to be Ezra Van Horn. (The third and neutral trustee, subsequently selected by Lewis and Van Horn, is Thomas Murray, who has also been a Krug-Lewis trustee). Covers all existing funds collected under the Krug-Lewis agreement into the new fund (as an irrevocable trust), and provides that the fund may be used to make payments for medical or hospital care, pensions, compensation for injuries or illness, benefits for wage loss not otherwise compensated for, and for benefits for any and all purposes specified under the Taft-Hartley Act. Failure of operators to pay this levy may be deemed a violation of the agreement by the UMWA. The operators renounced any and all claim to payments made into the fund established under the Krug-Lewis agreement.

(5) As to wages and hours—for inside employees the contract establishes a workday, portal-to-portal, of eight hours, including a staggered 30-minute lunch period, to be paid for at straight time, with overtime at time and one-half beyond eight hours per day or forty hours per week. For all outside employees (except outside continuous employees who will work an eight-hour day the same as the inside employees), a workday of seven hours and fifteen minutes is established, including a 30-minute staggered lunch period, with overtime payable at time and one-half after this scheduled day and beyond 36¼ hours per week. All mine workers are to receive $3.05 per day over the rates which they received in the 1946 wage agreement ($10.00 basic wage per 9-hour day, figured at $1.00 per hour for the first seven hours and $1.50 per hour for the last two hours), or a daily wage of $13.05. (Under the Krug-Lewis agreement, wages were raised 18½ cents an hour, making a basic wage of $11.85 for the 9-hour portal-to-portal day). Provides that work may be performed on the sixth day but must then be paid for at time and one-half; holidays must be paid for at time and one-half or rate and one-half; holidays and "starts" shall be computed in arriving at the sixth and seventh days in the week. Rockdusting is to be done at the expense of the operator.

(6) Establishes a vacation period of 10 days with a payment of $100.00 to those qualifying, and pro rata payments to those with less than a year's service at the vacation time.

(7) Provides the check-off of union dues and initiation fees, with employers to aid the union in obtaining written assignments from all employees in order to comply with the Taft-Hartley Act.

(8) Provides for settlement of local and district disputes through a procedure ranging from discussions between the aggrieved party and the mine management through settlement by an umpire appointed jointly by the operator affected and the UMWA.

(9) Provides that house coal is to be sold all employees at the cost of production.

(10) Rescinds all "no strike", "penalty" or "illegal suspensions of work" clauses which appeared in previous contracts.

(11) Corrects any contract provisions providing for a "protective wage clause" to apply in the event any more favorable wage agreements are entered into by the UMWA. (Lewis told the press that this contract represents the "minimum wage" that the mine workers will accept).

(12) Specifically sets forth that the contracting parties agree to settle any and all disputes arising from the contract through the Boards set up in the contract, or if the dispute is of national character through the full use of collective bargaining.

Practically all of the remaining bituminous coal operators in the country signed the Wage Agreement within a very few days.

Revision of the working contract for the anthracite region was announced July 10 and includes a wage increase of $1.20 per day. The new wages are $11.09 a day for inside men and $9.40 for outside men, and their welfare levy is also raised from 5 to 10 cents per ton. The basic work day of seven hours remains unchanged.

Joint Labor Committee

Senator Joseph H. Ball (Rep., Minn.) is Chairman of the new Joint Congressional Labor Management Relations Committee which has been created under the terms of the Taft-Hartley Labor Act. The Committee is made up of 7 Senators and 7 Representatives and is directed to study: (1) the means by which permanent friendly cooperation between employers and employees and stability of labor relations may be secured throughout the United States; (2) means by which individual employees may achieve a greater productivity and higher wages, including plans for guaranteed annual wages, incentive profit-sharing and bonus systems; (3) internal organization and administration of labor unions, with special attention to the impact on individuals of collective bargaining agreements requiring membership in unions as a condition of employment; (4) labor relations policies and practices of employers and associations of employers; (5) desirability of welfare funds for the benefit of employees and their relation to the Social Security system; (6) methods and procedures for best carrying out the collective bargaining processes, with special attention to the effect of industry-wide or regional bargaining upon the national economy; (7) administration and operation of existing Federal laws relating to labor relations; and (8) such other problems and subjects in the field of labor management relations as the Committee deems appropriate.

The Committee is first planning an investigation of collective bargaining in a number of industries including coal, steel, glass-making, garment, maritime, meat packing, foundries, trucking, and textiles.

Although the Senate Committee on Labor gave the green light to the nominations of former Senator Abe Murdock of Utah and J. Copeland Gray as new members of the National Labor Relations Board, the Senate did not act on the nominations before adjournment. The same is true of the nomination of Robert Denham as counsel for NLRB and it is anticipated that all three of these men will receive recess appointments from the White House.

Federal Coal Mine Inspection

Senator Butler's (Rep., Neb.) Federal coal mine inspection resolution, S. J. Res. 130, discussed in the June Journal was reported in a much milder form, passed by both Houses and sent to the White House. The measure now directs the Federal coal mine inspectors to notify owners and operators of coal mines and also State mine inspection agencies of Federal Mining Safety Code violations, requesting that they report to the Director of the Bureau of Mines action taken with respect to Federal inspectors' recommendations. Particularly stressed are the Code safety standards with respect to ventilation, rockdusting, storage and use of explosives, roof and rib support, use of water or water with a wetting agent or other means of dust control where mining operations raise an ex-

(*Continued on page* 61)

Personals

Ira F. Davis retired as assistant vice president for coal traffic and development of the Chesapeake & Ohio Railway Company on July 1 after 27 years service with the company. Walter J. Tuohy, vice president, in announcing Mr. Davis' retirement, stated that his "intimate and comprehensive knowledge of the coal fields of Southern West Virginia and Eastern Kentucky has made his services invaluable alike to the railway company and to the coal operators which it serves."

Mr. Davis has been succeeded by **Charles E. Lawall**, who was formerly engineer of coal properties. He is making his headquarters at Huntington, W. Va.

Dr. R. R. Sayers, former Director of the U. S. Bureau of Mines, has been appointed chairman of the Medical Board established by the Trustees of the UMWA Welfare and Retirement Fund to serve the bituminous industry. Dr. Sayers has taken leave without pay from his post with the U. S. Public Health Service to serve in this new position. Dr. Sayers came to the Bureau of Mines seven years ago from the Public Health Service and it was previously announced he was returning to that agency. **Thomas H. Miller**, former assistant director of the Bureau, has been named acting director.

Henry C. Carlisle, prominent mining engineer of San Francisco, has recently been elected a director of Bonanza Mines, Inc. and is taking an active part in the management of the company's mining affairs. He will be assisted by Herbert N. Witt, also a well known mining engineer.

A. B. Campbell, former manager of supply for the Pacific Coast Borax Company, has recently resigned from the company and bought a ranch at Etna in Siskiyou County, California.

Paul Mackall, vice president of Bethlehem Steel Company has announced that **J. M. Ellis**, general manager of sales since 1936, has been appointed assistant to the vice president.

Louis Ware, president of the International Minerals and Chemical Corporation, has left for Stockholm to confer with leading users of phosphate rock in eight European countries. He will visit Sweden, Norway, Denmark, The Netherlands, Belgium, Switzerland, France and Great Britain and expects to return to Chicago in September. He is accompanied by Mrs. Ware.

Samuel H. Williston has been elected vice president and general manager of the Sperry-Sun Well Surveying Company, succeeding G. L. Kothny. Mr. Williston was identified with the company at the time of its formation in 1928 and was instrumental in developing the original gyroscopic well surveying instruments. He will continue as vice president and director of the Cordero Mining Company, which has mercury mining operations in Oregon, Nevada and California.

Harold B. Wickey has succeeded **J. C. Constable** as superintendent of Mine No. 38 of the Consolidation Coal Co., Fairmont, W. Va. He had formerly been a special engineer for the company.

Wickey served with the Mining Division of the War Production Board from May 1942, through March 1946. Prior to that he was associated with the Davis Coal & Coke Co.

Richard W. Senger, former director of technical employment, American Smelting and Refining Co., retired recently after 41 years' service with the company.

He joined the company in 1906 in El Paso and then worked in various A. S. & R. plants in Mexico until December, 1915. From that date until 1940 he worked at the Garfield plant of the company as metallurgist, assistant superintendent, and for 17 years as superintendent. From 1940 until his retirement he was director of technical employment and training. Mr. Senger plans to make Salt Lake City his headquarters but will spend some time in traveling.

O. L. Dever, former manager of the Hanna Coal Company, Youngstown, Ohio, has been made vice president of the Central West Coal Company, Columbus, Ohio.

E. M. Platts has been named vice president in charge of sales for the Joy Manufacturing Company, according to an announcement by **Arthur S. Knoizen**, executive vice president. In his new position, sales of all Joy products will come under his supervision.

Charles L. Knaus, Tyrone, N. Mex., has been appointed Deputy State Mine Inspector. He is serving as inspector of mines other than coal. To his new post he brings wide experience as a mining engineer, geologist and civil engineer in Colorado, New Mexico and Nevada.

During the war he was design and staff engineer for Basic Magnesium, Inc., Las Vegas, Nev., and later was mine engineer and general mine superintendent of the New Mexico Ore Processing Co., Silver City.

Frank C. Wright, Jr., who was the Washington representative of the Anthracite Institute during the war and the immediate postwar period, has resigned his position and is spending the summer at Edgartown, Martha's Vineyard, Mass.

He has been associated with the anthracite industry for the past 12 years, first with the Penn Anthracite Collieries Co., Scranton, and later as vice president of the Philadelphia & Reading Coal & Iron Co. In 1942, at the request of the producers he accepted the industry representation in Washington.

Dr. M. M. Leighton, for the past 24 years, chief of the State Geological Survey at Urbana, Ill., was cited by the State University of Iowa, at its recent commencement, as a "Distinguished Alumnus," in recognition "of his eminence in his chosen field of geology and of his contributions to the public welfare."

Dr. Leighton received his Bachelor of Arts degree from Iowa in 1912, at which time he won the Honorable Frank O. Lowden prize in geology. He received his Master of Science degree from the same university one year later. His citation was made at Iowa's centennial celebration of its founding.

James P. Margeson, Jr., has been elected executive vice president of the International Minerals and Chemical Corp., and **Edward D. McDougal, Jr.**, has been elected corporation secretary and general counsel.

Since 1942 Mr. Margeson has been vice president in charge of the mining

James P. Margeson, Jr.

Edward D. McDougal, Jr.

and distribution of potash. Mr. McDougal comes to the corporation from the law firm of Sidley, Austin, Burgess and Harper.

Robert B. Wilson, former employment manager for Houdailles-Hershey Corporation at Huntington, W. Va., has been named assistant personnel officer for the Island Creek Coal Company. He will assist **H. W. Lowe**, director of the personnel office, at Holden.

Butler Brothers, St. Paul, Minn., have announced the following appointments: **Peter Warhol** as vice president for operations; **C. L. Wyman** as vice president for sales; and **Earl S. Mollard** as manager of mines. All three assumed their new duties on July 15.

The Kentucky Coal Association has elected **Brent Hart**, Madisonville, president. **George P. Fitz** of Hazard was named vice president, and **C. X. Johnson** of Lexington, was elected secretary-treasurer.

Perry G. Harrison, formerly president of the Evergreen Mines Co., of Crosby, Minn., has been named vice president of the Hanna Coal & Ore Corp. The Evergreen Mines Co. has been merged into the Hanna Coal & Ore Corp., operating subsidiary of M. A. Hanna Company's iron ore, docks, vessel and lake coal business.

Dr. Arthur C. Bevan, State Geologist of Virginia, Charlottesville, will transfer to the post of principal geologist of the Illinois Geological Survey on September 15. In this post he will have charge of the Geological Resources Section of the Survey and will succeed **Dr. Ralph E. Grim**, who will devote his attention to the Survey's research program on clay minerals.

E. B. Greene is chairman of the board of directors of the new company resulting from the merger of the Cleveland-Cliffs Iron Co. and the Cliffs Corp.

Directors of the new company include both boards of the combined concerns. Members are **E. B. Greene, Alexander C. Brown**, president; **Cyrus S. Eaton, G. G. Wade, W. R. Burwell, M. B. Brainard, George Gund, T. H. Jones, E. E. Brown, Newell C. Bolton, G. B. Young, B. M. Gillies, Jr., P. R. Mather**, and **R. W. Purcell.**

Timothy L. Sullivan has ended 52 years of continuous service at the Pittsburgh plant of the Federated Metals Division, American Smelting and Refining Company. Upon retiring he was the recipient of a plaque from Robert G. Lenhart, plant superintendent.

Obituaries

Thomas H. O'Brien, one of the outstanding mining executives of the nation, died June 25 at Los Angeles following a heart attack. His age was 78.

Born in New York State, his life for nearly 50 years was intimately enmeshed with the development of the West's mineral wealth. He started upon his mining career at the age of 21 with the Colorado Fuel and Iron Company. In 1890 he became superintendent of the company's properties at Rouse, Colo. He left this post after four years to join the Phelps Dodge Corporation. He served the corporation in various capacities until August, 1909, when he was appointed general manager of an affiliated company.

In June, 1920, he left the company to become general manager of the Inspiration Consolidated Copper Company and the International Smelting and Refining Company's branch at Inspiration. He was made a director of the company in 1932 and was elected vice president in 1936. He retired as general manager of the two companies in 1946, but continued as vice president. He continued to reside at Inspiration and took an active interest in the two companies.

Mr. O'Brien also was interested in banking. In 1901 he was elected a director of the Gila Valley Bank, parent of the Valley National Bank. He was made a director of the latter in 1930, vice president in 1936, and chairman of the board in 1940.

He belonged to many mining associations and was very active in the work of the Western Division of the American Mining Congress. He served as national chairman of the Program Committee for the Congress' Metal Mining Convention in Los Angeles in 1938.

Thomas H. Watkins, president of the Pennsylvania Coal & Coke Co. from 1910 to 1923, when he retired, died at New Haven, Conn., June 25, at the age of 87. Born in Pittston, Pa., where his father was superintendent of a local mine, he began his career as a bookkeeper and buyer for a coal operator.

James E. Woodward, former treasurer of the Anaconda Copper Mining Co., and its various affiliates, died at Roosevelt Hospital, New York City, on July 23 after a long illness.

Born December 16, 1882, in Omaha, Nebr., he graduated from Creighton University there in 1901. After an extensive experience in the coal mining industry in Montana, he became for many years the president of the Metals Bank and Trust Co. of Butte, Mont. He was also a director of the First Bank Stock Corp., of Minneapolis, the Montana Power Co., the Montana Flour Mills Co., and the Electrical Products Consolidated Co., of Seattle.

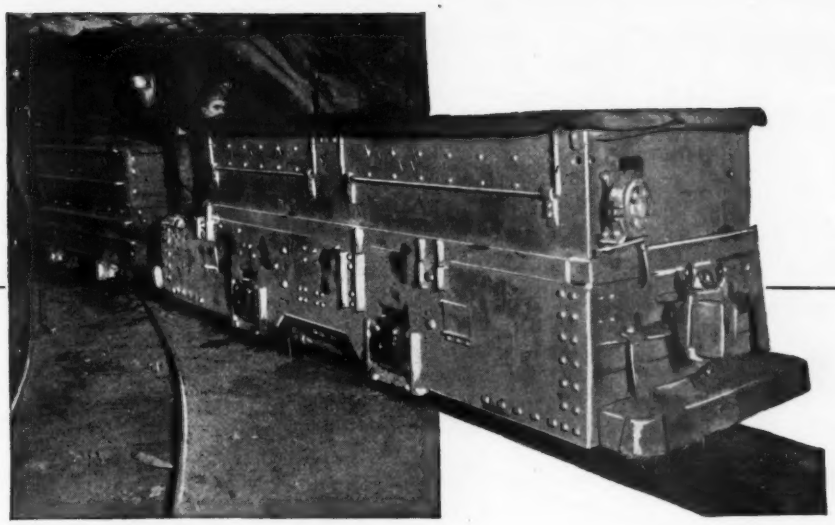
Surviving are his widow, Judith Waite of New York; a daughter, Mrs. Edward H. Reed; and a son, John, both of Los Angeles; besides Claire Helene Woodward of Omaha, and Mrs. C. K. Bain of St. Louis, sisters.

Robert L. Dean of Salt Lake City, former district superintendent of the St. Louis Smelting and Refining Co., died of a heart attack on June 27 at the Pioche mine of the Combined Metals Reduction Co. He was in his early fifties.

Carl F. Whitham, 64 years old, Alaska mining operator, died recently after a long illness and was buried at Olympia, Wash. At the time of his death he was president and manager of the Nebesna Mining Company near Valdez, Alaska.

George W. Raimer of Opportunity, Wash., a metallurgist and resident of the Spokane mining area for more than 41 years, died recently after a short illness.

Born in Danville, Ill., he received his early training in the Colorado School of Mines, and thereafter was affiliated with the mining industry of the Pacific Northwest in various capacities for many years.



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After an EDISON Nickel-Iron-Alkaline Battery has delivered its normal service life in a locomotive or shuttle car and has to be replaced because the battery is no longer of sufficient capacity for the work, its cells, instead of being scrapped, are often regrouped into other batteries for lighter-duty uses for which their capacity is still ample.

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FREE ADDITIONAL POWER —

The electrical departments of a number of mines have been doing just that; in effect getting new batteries free which, in various stand-by jobs, often give many more years of dependable performance. The fact that nickel-iron-alkaline batteries can do this is a good illustration of their unequalled dependability on the original job.

The reasons are few and simple: steel cell construction; an alkaline electrolyte that is a natural preservative of steel; a principle of operation free from self-destructive reactions. Because of their long life, simple maintenance, and trouble-free characteristics, EDISON Nickel-Iron-Alkaline Batteries also help cut haulage costs. ***Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. In Canada: International Equipment Company, Limited, Montreal and Toronto.***

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* *One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.*

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Washington's population has shown a great growth; providing a large local consumer market and source of industrial workers.

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From a viewpoint of good living, the Evergreen State offers a year 'round scenic playground . . . excellent educational and cultural advantages.

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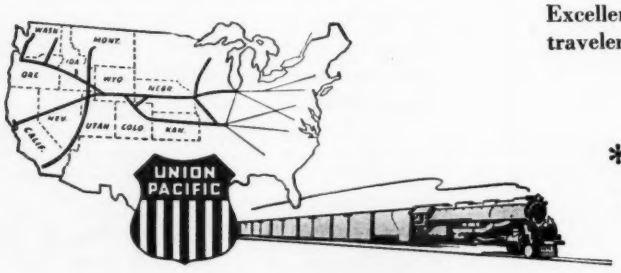

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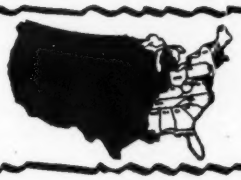


Phosphate Prospects

Louis Ware, president of International Minerals & Chemical Corporation, told stockholders recently in a letter that preliminary figures indicate the fiscal year ending June 30 will establish new records in both sales and earning for the company.

"In two important respects, the company will have expanded production in the coming year," he said. "The new amino products plant in California has been completed and the large Noralyn mine in the Florida phosphate field now under construction will be finished during the coming year. The market demand for the increased production that will be supplied by both of these plants continues excellent.

"The world's needs are such that the country has again called for a full farm production during the coming year. This means continued high demand for phosphate, potash, and fertilizer.

"In the phosphate division, the Noralyn mine under construction in Florida is expected to be in operation late this year. The embodiment of new mechanical and ore-dressing features for highest efficiency together with its location on the rich ore body purchased in 1945 will enable this mine to produce ore of the highest grade.

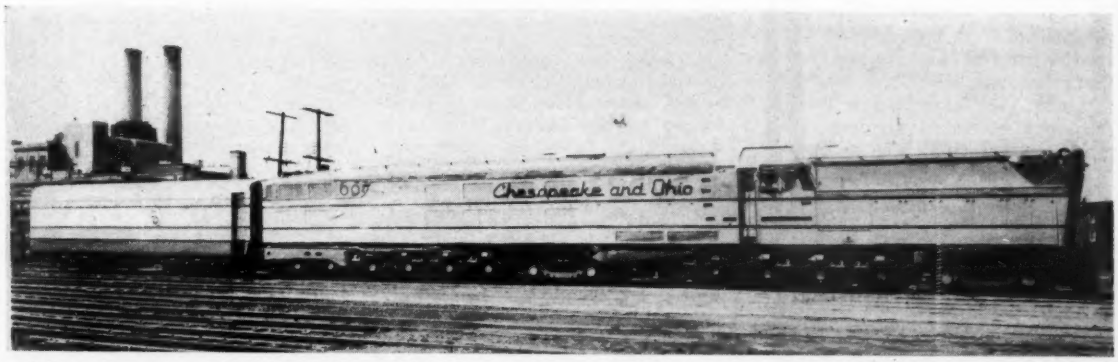
"The company has been successfully marketing large quantities of phosphate rock for export during the immediate years ahead and the phosphate division is contributing materially to the profits of the corporation. With this new expansion and favorable market outlook, our phosphate business is in better condition than ever before."

New Device Saves Fuel

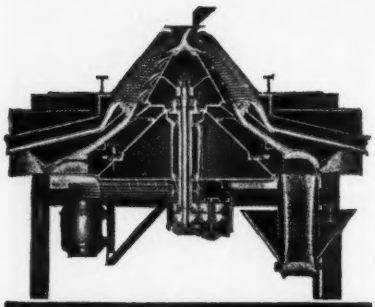
Successful completion of development work on the new undergrate air distributor for coal-burning locomotives was announced recently by BCR's Motive Power Committee.

This device increases the efficiency of burning coal in the steam locomotive by improving the distribution of undergrate air for combustion. With uniform air flow to the fuel bed, excessive losses of unburned coal out the stack are avoided and the value of bituminous coal as a locomotive fuel is increased. Road tests, it was reported, indicate fuel savings of from 7 to 15 per cent, depending on the speed of the locomotive. Another important advantage claimed is a reduction in clinkering which lowers maintenance cost and increases the availability of the locomotive.

The air distributor was invented by Vaughn Mansfield, chief engineer of the Southern Coal Co., Inc., Memphis, Tennessee, and was perfected by BCR in cooperation with the in-



A feature attraction at the Railroad Show in Atlantic City June 23 to 28 was this 6,000-hp. steam turbine electric locomotive, the first of a new coal burning type. Built by The Baldwin Locomotive Works for high-speed, deluxe passenger service on the lines of the Chesapeake & Ohio Railway, the locomotive and tender together weigh almost 600 tons and have an over-all length of 150 feet



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reduces the moisture content of the smaller sizes so low that troubles caused by clogged cars, spouts and chutes are eliminated and the product is also suitable for blending. Users tell us that by the installation of these "C-M-I" dryers they have kept their customers satisfied and also expanded their markets.

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ventor. The undergrate air distributor will be supplied by The Standard Stoker Co., at Erie, Pa.

The device is composed of parallel air-flow baffles, or vanes, which are attached to the locomotive firebox where the air enters the ashpan. The baffle unit may be installed at the nominal cost of a few hundred dollars.

Mineral Producers Association Meeting

At the meeting of the Mineral Producers Association held in Pittsburgh, June 27, the following directors were elected for a two-year term:

R. R. Bowie, Bowie Coal Company, Grove City, Pa.; John B. Brunot, Irwin Gas Coal Corporation, Greensburg, Pa.; W. A. McBride, Jefferson Coal & Coke Corporation, Burgettstown, Pa.; R. S. Walker, Bradford Coal Company, Bigler, Pa.; and F. B. Wood, Sr., F. B. Wood Coal Mining Company, Barnesboro, Pa.

In the afternoon session papers on explosives were presented by John Jeffries, of the Atlas Powder Company, and Don B. McCloud, of DuQuoin, Ill. Allan O. Geertz, fuel engineer of the Pennsylvania Railroad, spoke on "What is this Fuel Called Coal?" In his remarks he recommended certain types of preparation that would facilitate the utility of coal. M. A. Crawford, general counsel of the association, and Milton Carr Ferguson, attorney at law, Washington, D. C., spoke on recent legislation affecting the industry. Mr. Harry Gandy, Jr., of the National Coal Association, described at some length the provisions of the Taft-Hartley Bill. R. S. Walker, of the Bradford Coal Company, Bigler, Pa., vice president of the association, presided at the afternoon session.

At the dinner session, R. R. Bowie, of the Bowie Coal Company, Grove City, Pa., president of the association, presided. Talks were given by the Hon. Richard Maize, Secretary of the Department of Mines, and O. Ben Gipple, Department of Forests and Waters, and the Hon. Leon H. Gavin, member of the United States Congress. R. T. Laing, executive secretary of the association, served as toastmaster. There were 300 members and guests in attendance.

L. E. YOUNG
Consulting Engineer
Mine Mechanization
Mine Management
Oliver Building Pittsburgh, Pa.

Power for Underground Mines Discussed

One hundred and ten visitors and members of the Central West Virginia Coal Mining Institute met at the Stonewall Jackson Hotel Friday evening, July 18, 1947, to hear David E. Renshaw, industry electrical engineer of the Westinghouse Electric Corporation, Pittsburgh, discuss "Power For Underground Mines." The speaker described the various types of machines used for converting alternating current to direct current, and gave particular attention to the Ignitron Rectifier, which he helped to develop. Slides were shown to describe and to compare the ancient and modern rectifiers and also to show the different size of machines.

After Mr. Renshaw's talk, the audience participated in the discussion by asking questions. This was followed by the film entitled "Summer Storm," which presented the everyday occurrence our local electric power company must guard to insure the public the electricity it demands at any moment.

Special guests of the Institute were Monongahela Power Engineer, local Westinghouse technical personnel, and members of both the Clarksburg and Fairmont Chapters of the Society of Professional Engineers. Other guests were J. S. Malesky, Bureau of Mines, Vincennes, Ind., and Mr. Cloyd M. Smith, consulting engineer, Washington, D. C.

It was announced the August meeting will be held in the Fairmont Hotel, Fairmont, W. Va., August 22, at which time C. E. Bailey, Transportation Division of General Electric, will present a paper "The Railroad Outlook."

It was also announced by George McCaa, chairman of the Annual Banquet Committee, that the annual banquet will be held Saturday, September 20, 1947.

Plant to be Closed

The Langeloth, Pa., plant of American Zinc and Chemical Company is being closed, according to plans disclosed in an announcement by B. N. Zimmer, president, at a conference with representatives of Local 95, CIO-United Mine, Mill and Smelter Workers.

Decision to close the plant was reached, according to report from the conference, because the plant uses an obsolete process in the production of non-ferrous metals. Some 900 workers at the plant will be affected by the closing, it was stated.

The plant will continue to operate for some time so that current supplies of raw materials can be converted and also to provide workers with time to plan readjustment. A

company spokesman was quoted as saying that many workers, living in company houses in Langeloth, would be permitted to continue living there without payment of rent for the time being.

A severance pay plan, not included in the present union contract, has been offered by the company. Workers with three or more years of service will be eligible for severance pay. Three years service will entitle an employe to 20 days pay, five years to 30 days pay, seven years to 35 days, and 10 or more years, 40 days.

The union was requested by the company to extend the present wage agreement until the end of 1947 to cover future operations, freeze wage rates as of June 30, 1947, place seniority on a departmental basis, and to accept vacation pay not already paid. It was expected that the plant would be closed during the final quarter of 1947.

Safety Program Cited

The over-all safety program at the Marianna Smokeless Coal Company's Marianna No. 1 mine has been commended in a Federal inspection report issued recently by the Bureau of Mines.

The development, employing 105

Using a timber-setting truck to get a heavy timber cross collar in position against the roof of an ore mine of United States Steel Corporation in the Birmingham, Alabama, district operated by its subsidiary, Tennessee Coal, Iron and Railroad Company. Rollers facilitate movement of the timber. The timber is clamped securely in place in the cradle on the end of the boom. The boom is raised hydraulically by means of the hand pump on the left side of the truck to raise the cross collar against the roof and hold it there until anchored on the rib pins. Timbers weighing up to 900 pounds can be set with less effort, smaller crews and greater safety in over 60 per cent less time than required by old methods of handling timbers

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Ten years of field test has proven that our power-feed design of direct, transmission and worm gearing with two-speed control will not only cut shot hole drilling time in half but also eliminates costly maintenance delays. V-belt drive to the power-feed with an additional ample clutch in that assembly gives absolute control of a drilling speed of two to three feet per minute with a retrieving speed of twenty-four feet per minute.

The Parmanco Horizontal is adapted to all forms of high-wall drilling, will handle a six-inch auger up to a distance of sixty feet or more and, by use of our patented augers with interrupted flights and secondary cutters, will drill an absolutely clean hole with a minimum of torque. It permits the drilling of a controlled-angle hole which makes possible a great saving of explosives through the cantilever effect of this controlled-angle drilled hole.

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WITH EFFICIENT DRILLING

PARIS MANUFACTURING COMPANY
PARIS, ILLINOIS

men and averaging 550 tons of coal daily, was examined in April and May by Inspector Frank J. Stortz under the terms of the Krug-Lewis agreement of May 29, 1946, and the Federal Mine Safety Code.

Inspector Stortz commended the effective rock dusting of the back entries and the use of wooden mallets and chisels for opening explosives containers. He also approved the location of the No. 1 ventilating fan near the shop, and the numerous other safety measures employed at the mine.

Strip Mining Law Passed

House Bill No. 1353, passed by both branches of the General Assembly of Pennsylvania, and known as the "Anthracite Strip Mining Law," was signed by Governor Duff June 30. It became effective immediately upon signature, but all persons or corporations engaged in strip mining on the effective date of the Act have until September 1, 1947, to file applications, secure permits and deposit filing fees and bonds with the Department of Mines.

According to the provisions of the Act application for a permit to engage in strip mining must be filed with the Department of Mines, accompanied by a license fee of $25 per acre, minimum $100, covering the estimated area of land to be stripped in the year ahead. This fee is not recoverable. The operator must also file a bond with the Department amounting to $200 per acre, minimum bond $2,000, as a guarantee that the provisions of the bill will be satisfactorily carried out, after which the bond is cancelled or the securities returned to the operator.

The per acre is of the area of the land affected and this is defined as "The area of land from which the overburden is removed."

The operator must backfill to a distance of 75 ft. from the center line of any public highway, 200 ft. from any dwelling or public building and also backfill in a sufficient amount to thoroughly cover any exposed vein of coal.

The peaks and ridges of all spoil banks must be leveled or rounded off to such an extent as will permit the planting of trees, grasses or shrubs. This work must be carried out within one year after the operation is terminated. The operator has the alternative of doing the planting himself or of paying $60 per acre to the Department of Forests and Waters for each acre of such surface of spoil banks and backfillings. If he chooses to pay the $60 it relieves him of all responsibility in connection with the planting of the trees, shrubs, grasses, etc.

Mine Opened

The Johnstown Coal & Coke Co., recently opened their new Logan No. 3 mine at Lloydell, Pa. Located on the upper Freeport seam, the operation has a capacity of 2,500 tons of bituminous coal daily. A Belknap Washery is to be installed and the mine is serviced by the Pennsylvania Railway. J. W. Chrichton is superintendent and John Martin is foreman of the new operation.

Tipple to be Rebuilt

The Pittsburgh Coal Co. has asked Federal permission to rebuild its Mongah mine tipple and install pile clusters in the Monongahela River on the right bank in Forward Township, Pa. The projected improvements include a belt conveyor, a loading chute and a barge mover.

Tree Planting Program

An experiment in planting trees in bare open mine pit areas is being supervised in Allegheny County, Pa., by Pennsylvania State College. Various seedling trees are being planted to determine which will best survive in the soil of the strip-mine banks.

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These rugged, heavy duty hydraulic jacks combine ease of lift, lightness and safety. Each unit is factory-tested to 50% over rated capacity. Built in 3, 5, 8, 12, 20, 30, 50 and 100 ton capacity models.

Features that make Simplex Hydraulic Jacks top choice for jacking jobs on equipment used in strip mining operations include (1) Minimum closed height and maximum lift, (2) Pressure tested malleable iron top nut and base, (3) Neoprene pressure packing, (4) Drop forged steel caps that cannot come loose.

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Work Under Way on Shaft

The Cleveland-Cliffs Iron Co. is sinking its new production shaft on the Marquette iron range. It is known as "B" shaft, located about one mile east of the Mather shaft. The Mather shaft is located within the city limits of Ishpeming, and the "B" shaft is located within the city limits of Negaunee, the principal mining communities on the Marquette range.

Mining Company Changes Offices

Oglebay, Norton & Co. has opened a northern mining office at Montreal, Wis., in charge of F. J. Smith, range manager. The new offices are located on a site near that of the Montreal Mining Co. and houses departments of management, engineering and research. Dan S. Young, assistant superintendent of the Castile Mining Co., has been appointed chief engineer for Oglebay, Norton & Co., with offices in the newly established quarters. Wm. S. Baxter, chief engineer of the Castile Mining Co., has been advanced to assistant superintendent, to succeed Mr. Young on the Castile staff.

Copper from Mill Tailings

The Quincy Mining Co. continues to operate its reclamation copper recovery plant from mill tailings at Mason, Mich., on the shore at Torch Lake, currently its sole source of copper since the underground operation at Hancock, Mich., was closed in 1945. Before the company closed down its underground department it was hoisting copper ore from shafts No. 6 and No. 8. In 1942 Quincy opened its 91st, or deepest level. Quincy No. 2, the deep incline shaft, which houses the reputedly largest mine hoist in the country, though idle, is kept intact for the future.

The Quincy Mining Co. has ore parallel to its developed lode, which the company plans to test out by future diamond drilling.

Progress Made on Old Shaft

The Calumet & Hecla Consolidated Copper Co. is making progress rehabilitating the Seneca No. 2 shaft, north of Calumet, Mich. A steam hoist is being transferred from another property to the Seneca shaft to hoist skips on this 3,500 ft. incline hoisting system. The mine last produced in 1930, when it was operated by the Seneca Mining Co., with the late W. M. Uren as general manager.

Blue Bird Properties Sold

Holdings of the Blue Bird Mining Company, a mile southwest of Cardin, Okla., were recently disposed of to the Eagle-Picher Mining and Smelting Company. The Blue Bird company held leases on the old Blue Bird and Wilson holdings, and had been conducting mine operations on the former lease the last several years.

Mine operations were suspended at the end of June with the closing of the deal, and since the first of July the Eagle-Picher Company has been carrying on development work at the properties.

Ore from the properties was shipped by the Blue Bird Company by rail from the company hoisting derrick and hopper on the old Blue Bird mill shaft to the Central mill for treatment. Associated in the Blue Bird Company were Carl Williams, Robert Tuthill, Reginald B. Walker, Ralph Sears, all of Miami, and the widow of the late Tom Lennan, widely known pioneer Tri-State mine operator who was instrumental in the organization of the Blue Bird Company.

New Shaft to be Sunk

Preparations are being made by the F. & G. Mining Company to sink a new shaft on the Lindsey land, a 72-acre tract situated two miles northeast of Picher in Kansas, according to W. T. Graham.

The shaft will be put down on a drill hole northeast of old west shaft on lease, Graham said. It will be sunk to a depth of 170 ft., where 22½ ft. of zinc ore, averaging 3 to 7 per cent in recover values, was disclosed. Graham also reported that some good holes were put down on the tract more than 20 years ago by the M. & H. Zinc Company.

A sinking derrick from the old Evans-Wallower No. 24 lease will be moved to the shaft site, and a 20-ft. head house will be added for dumping

HENDRICK PERFORATED PLATE

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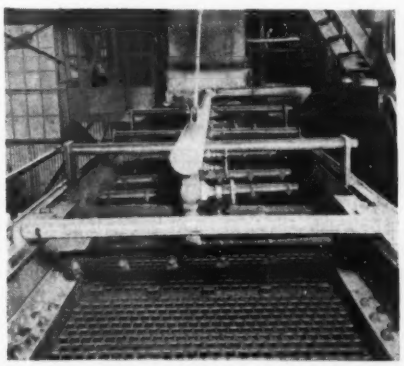

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on the ground. A 30 by 44-ft. structure will be moved in to house a 590-cu. ft. Ingersoll-Rand compressor, which will be powered by a 75-hp. electric motor. A 20 by 8-ft. receiver will be installed in conjunction with the use of air for sinking.

Recribbing Old Shaft

Eagle-Picher Mining and Smelting Company is recribbing and repairing the old Mullins shaft, just north of the company's Foley No. 3 shaft two miles north of Picher in Kansas, according to S. S. Clarke, general mine superintendent for the company.

The shaft, which is about 320 ft. deep, will be reopened and sunk 75 ft. deeper, and will be used as a man-shaft and for ventilation purposes. It will connect with the workings by an upraise from the Foley underground workings, which are 450 ft. deep. Clark was with the company 23 years ago when the Mullins shaft was sunk.

Shaft Completed in Tri-State

Dewey Sims, of Miami, has completed a new shaft on the old Commerce Pelican lease, two miles northwest of Picher and just south of the Oklahoma-Kansas State line. The mine is being opened up on the 230-ft. level, and the shaft is situated just west of the Eagle-Picher Gordon No. 3 mine.

Crushing Plant Installed

A new crushing plant was recently installed at the F. W. Evans Sucker Flat mill in the south-central part of Webb City, Mo., at an estimated expenditure of $25,000. The plant was installed to handle oversize reject material stockpiled over a period of several months from the milling of ore from the Sucker Flat open pit mine operations.

Lake Superior Iron Reserves

The Lake Superior iron ore reserves are sufficient to sustain operations for 40 years, according to two nationally known mining geologist engineers. They estimated the commercially useful deposits of ore in the region at about 2 billion long tons.

The estimates were made by William H. Cargo and Hugh M. Roberts, both of Duluth, testifying for the Great Northern Railway at an Interstate Commerce Commission hearing early in July. The railway, a big iron ore carrier, is the defendant in a rate reduction action brought by Butler Bros., a Minnesota mining concern.

Mr. Cargo said that on the basis of a survey he had made, he estimated that on May 1, 1945, there were approximately 2 billion long tons of commercially useful ore in the district.

"This is a conservative figure that more detailed studies will only serve to increase," he added.

Citing the Cargo survey as his authority, Mr. Roberts estimated iron ore reserves in three Minnesota ranges (Mesabi, Cuyuna and Vermillion) at more than 1½ billion long tons. He added there were about 392 million long tons in the Gogebic, Marquette and Menominee ranges in Michigan, and 36 million in the Wisconsin-Penokee-Gogebic range.

New Illinois Coal Association

The Bituminous Coal Producers Advisory Board for District 10, which passed out of existence with the end of the Federal Government's wartime control powers on June 30, has been succeeded by a new organization known as the Illinois Coal Producers

THE Leahy HEAVY DUTY

NO-BLIND
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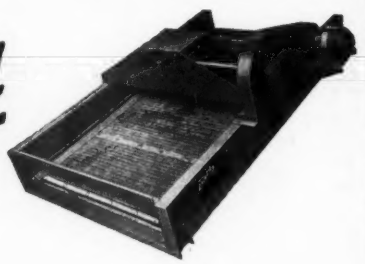

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Concenco Spray Nozzles are simple and effective . . . easy to apply by drilling oversize hole in spray line and clamping in place . . . leak-proof when positioned where desired . . . and they deliver effective sheet flow discharge for efficient washing results.

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Advisory Association. The chief purpose of the new organization, which starts operation representing about 75 per cent of the state's tonnage, will be to carry on the records and statistical information which was started back in the days of NRA. The Illinois coal producers feel that the continued collection of this information pertaining to tonnage movements, cost, realization, etc., is decidedly a worthwhile project.

The new association is headed by J. R. Henderson as chairman and secretary, with M. M. Soule, vice chairman, and George A. Miller, treasurer. Directors include: Gregory S. DeVine, Binkley Coal Co.; Barton R. Gebhart, Chicago, Wilmington & Franklin Coal Co.; L. F. Lumaghi, Lumaghi Coal Co. (St. Louis); H. F. McDonald, Bell & Zoller Coal Co.; George A. Miller, Peabody Coal Co.; M. M. Soule, United Electric Coal Cos.; and J. R. Henderson.

Plant Moved to New Site

In recent months the Mesaba-Cliffs Mining Co. has been in the process of moving its Holman iron ore washing plant from a former site to its new one at the edge of the Holman pit at Taconite, Minn. The plant formerly was served by rail haulage to transport wash ore and now at the new site, on the south side of the pit, belt conveyors will deliver the mill feed directly and continuously to the top of the washing plant from the pit.

The removal of the plant, knocked-down, has been a large undertaking and is a task similar to the one undertaken when the Canisteo washing plant at Coleraine was moved the same way some years ago.

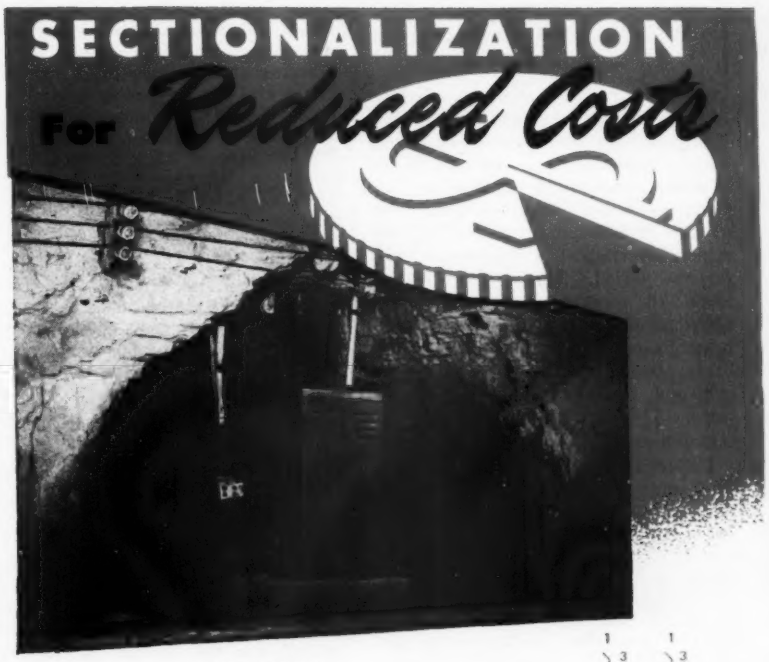
New Michigan Iron Property Opening

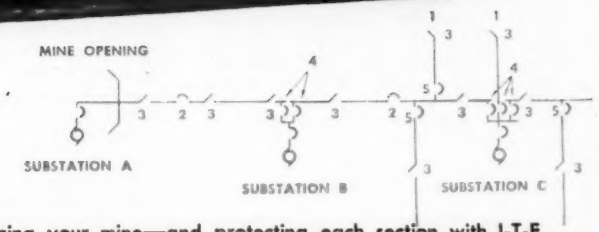
The Jones & Laughlin Ore Co. is clearing a site for a new shaft to open the Vičar iron ore property, located 2 miles east of Wakefield, Mich. The Vicar will thus be the most easterly active mine on the Gogebic iron range. The announcement of the new 600 ft. shaft follows a number of years of diamond drilling at the property. Surface diamond drilling is continuing at the present time. It is planned to have a staff of about 150 men for the mine opening. The firm has opened an office in Wakefield which is in charge of R. C. Comer, superintendent of the Vicar operations.

The MacKillican Iron Mine

Butler Bros. have announced the naming of one of their new properties after James A. MacKillican of Hibbing, Minn. Mr. MacKillican has for many years been a leader in the development of low grade iron ore properties.

SECTIONALIZATION For Reduced Costs





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Here's how sectionalizing helps achieve good power. Look at the typical application above.

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I-T-E Type KSC Automatic Reclosing Circuit Breakers protect your mine in many other ways. Find out how by contacting the I-T-E Mining Specialist in your neighborhood. He will be glad to make an application analysis of your mine electrical distribution system. Use him—at no obligation. I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

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(3RD OF A SERIES ON RECOMMENDED SECTIONALIZING PRACTICE USING THE KSC)

SECTIONALIZING Switchgear

Wheels of Government

(*Continued from page 52*)

cessive amount of dust, and prevention of fires in the underground workings. The resolution also requires the Secretary of Interior to report each three months, commencing September 1, to Congress with respect to conditions of all bituminous coal and lignite mines investigated or inspected during the period. The report is to include all recommendations and notices to State agencies and action taken by mine owners, operators, and State agencies with respect to the inspectors' findings and recommendations. The law would remain in effect for one year.

Following the resignation of Dr. R. R. Sayers as Director of the U. S. Bureau of Mines on July 14, the Senate Public Lands Committee approved the nomination of James Boyd, a western mining engineer, and recommended that he be confirmed by the Senate. In the last minute rush for adjournment the Senate failed to act on this appointment. Meanwhile, Dr. Sayers has become Chief of the Medical Board established by the trustees of the UMWA Welfare and Retirement Fund.

Stream Pollution

The Barkley-Taft Water Pollution bill, S. 418, was passed by the Senate July 16, following its report in rewritten form by the Senate Committee on Public Works. No further action was taken by the House Committee on Public Works on this or other pending water pollution measures.

In the bill passed by the Senate the Surgeon General and the Federal Works Administrator are put in charge of water pollution control. The definition of "interstate waters" is modified so as to exclude "and their tributaries." Pollution of interstate waters in or adjacent to any State or States, which endangers the health or welfare of persons in a State other than that in which the discharge originates, is declared to be a public nuisance and subject to abatement. The Surgeon General is directed to give formal notification of such pollution to persons and State agencies and specify reasonable time to secure abatement. If action to secure abatement is not commenced, the Surgeon General shall again notify and may recommend to the State agency that it initiate a suit to abate the pollution. If no action follows within a reasonable time after the second notification, the Federal Security Administrator is authorized to call a public hearing before a Board of five or more persons, at least one of whom shall be a representative of the water pollution agency of the State or States where discharge originates and one a representative of the Department of Commerce, and not less than a majority of the Board shall be persons other than officers or employees of the Federal Security Agency. After persons causing pollution are afforded reasonable opportunity to comply with recommendations of the Board, the Federal Security Administrator may, with the consent of the water pollution agency of the State or States, request the Attorney-General to bring a suit on behalf of the United States to secure abatement of the pollution.

The Court shall receive in evidence of any such suit a transcript of the proceedings before the Board and a copy of the Board's recommendation. The Court, giving due consideration to the practicability and to the physical and economic feasibility of securing abatement of any pollution proved, shall have jurisdiction to enter such judgment, and orders enforcing such judgment, as the public interest and the equities of the case may require.

Subject to the approval of State water pollution agencies the Federal Works Administrator is authorized to make loans to any State, municipality, or interstate agency for construction of treatment works, subordinated to other bonds or obligations; loans not to exceed 33⅓ per cent of estimated cost, and to bear interest at 2 per cent. Similar loans adequately secured are authorized to industrial enterprises.

St. Lawrence Seaway

Although the Senate Foreign Relations Committee voted 9 to 4 on July 18 to authorize the St. Lawrence Seaway and Power Project, Chairman Vandenberg (Rep., Mich.) stated that the Committee will delay its formal report until the opening of the second session in January. The House Committee on Public Works opened hearings on the St. Lawrence Project July 14 but Chairman Dondero (Rep., Mich.) stated that the hearings would be resumed at the next session of Congress.

Premium Price Plan

Representative Leo Allen's (Rep., Ill.) bill, H. R. 1602, discussed in the July Journal, was passed by the House July 22 and by the Senate on July 26, the night of adjournment. It now awaits the President's signature to become law. The measure authorizes subsidy payments for two years for copper, lead, manganese and zinc, in total amount not to exceed $70,000,000. Administration is by the Office of Premium Price Payments under the Secretary of Commerce.

Senators Millikin and Johnson of Colorado clearly set forth in the course of the Senate debate, that money is forthcoming from the Reconstruction Finance Corporation to make the payments under the Plan as required by the Allen bill.

Freight Rates

The Interstate Commerce Commission has announced hearings to begin September 9 on Ex Parte 166 following the petition of the railroads to increase freight rates by an average of 16 per cent. So far as announced, hearings will be held in Washington.

Freight increases varying from the general percentage were requested in the case of many commodities. Included are limestone and a number of kinds of rock at an increase of 20 cents per ton; sulphur, 1 cent per 100 lbs.; iron or steel scrap, 7 cents per 100 lbs. but not in excess of $1.40 per ton; cement and lime, 6 cents per 100 lbs.; and iron ore at 15 cents per ton. On bituminous coal, 15 cents per ton; anthracite from 10 cents to 30 cents per ton; coke from 10 cents to 30 cents per ton; and lignite 15 cents per ton.

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Western States

Gold-Silver Mine Leased

The Orizaba mine, located in the New River district of Maricopa County, north of Phoenix, Ariz., has been leased from the RFC by C. D. Brock, of Quartzsite, Ariz. The mine is said to have about 10,000 tons of gold-silver ore blocked out and available for mining. Brock, who plans to reopen the mine immediately, served as superintendent for the Orizaba Mining Company when the mine was in operation prior to the war.

Ore Shoot Appears Promising

Resumption of mining activity at Pinos Altos, Grant County, a former New Mexico gold-silver bonanza producer, is under way. A. V. dePascale, owner and operator of the Silver Hill mine, reports that under a cap of monzonite and porphry he is developing what appears to be at the shallow depth of 100 ft. a potential ore shoot that carries values in lead of 18 to 30 per cent; silver 3 to 19 ozs. and some gold.

New Company in Carlsbad Area

The Continental Potash Company of Kansas City, Mo., operating under a Federal potash prospecting permit, has been drilling in Eddy County, N. Mex., and has cored a section of soluble potash sufficiently rich to support a trial of the solution mining process patented in 1944 by Roy Cross, of the Kansas City Testing Laboratories. Cross said that he has been conducting tests in Section 22, about 15 miles northeast of Carlsbad in the vicinity of the Getty Oil Pool.

Gold Dredging Active in Southern Oregon

Stearns and Owens have moved their dragline operation from Poorman's Creek to the Applegate River near the town of Applegate, Oreg. This is a resumption of an operation started before the war. Part of the dredged ground will be resoiled. A 2½-yd. dragline will be used.

The W. E. Pantle Gold Dredging Company, which has been working ground near Jacksonville, has suspended operations because of lack of water supply. This company is testing ground at the town of Rogue River. If the testing work is sufficiently encouraging, leveling and resoiling will be practiced after dredging.

Law Encourages Mining

A new law passed by the state of Washington is designed to encourage development of state mineral resources and reduce the tax load of mining corporations during the development stage is now effective, Ray J. Yeoman, assistant secretary of state recently announced.

He said the new law, passed by the last legislature, permits corporations which do not own or operate any producing mine to pay a minimum annual incorporation fee of $10, irrespective of capitalization. After a mine starts producing, it pays the same fee as any other corporation. Yeoman said the law also permits reinstatement of mining corporations that have been dissolved for failure to pay annual license fees. They can be reinstated within a 20-year period by paying $10 for each year delinquent plus a $10 fee for the current annual license.

Placer Ground Being Tested

Porter Bros., a gold dredging company of Helena, Mont., has started work on a series of test holes in the St. Regis area to determine the feasibility of dredging operations. At present they have over 1,500 acres leased or under option from St. Regis to Henderson, a stretch of about 8 miles. They also have land in the Little Joe Basin which will be tested this summer.

An eight-man crew is working at St. Regis now on the test holes, which are made on an average of from 100 to 200 feet apart and are driven to bedrock. If the ground is proven favorable, it is planned to put three dredges in operation.

New Vein in Mother Lode

Drifting on the ore body recently discovered in the old Ballard gold mine five miles north of Plymouth near Jackson, Calif., continues to disclose ore, according to reports from the property. The vein is said to have widened to 8 feet, and assays show good values.

Operations were resumed at the property early this year by Ballard Mother Lode Mines Co. The new vein was found in a virgin section of the Mother Lode and its discovery is said by local mining men to forecast development of a new gold belt in the Plymouth area. The Ballard was operated more than 65 years.

Utah Mining Properties Consolidate

Consolidation of two Utah mining properties, the Mono and Kearsage, Inc. has been recently effected and a development program outlined for future operations at properties located in the Ophir Mining District.

Kearsage, Inc. was organized in 1941 and since that time has operated under a lease, the Kearsage mine and part of the Mono properties. During the first part of this year an option agreement was obtained from H. G. Wright of Salt Lake for purchase of the Mono Mine. The Kearsage group with ownership in the Ophir Treasures Mining Company are extending a lease to the new firm for 25 years.

Operators of the new firm point out that formations in the properties have a history of considerable production

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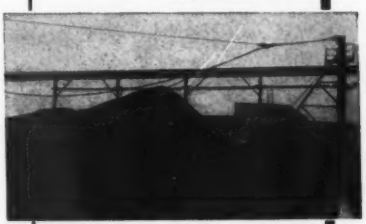

Above is a Sauerman Scraper handling piles of ore at refinery

You can move any loose materials — coal, ore, sand, gravel, clay—fast and efficiently with a Sauerman Power Scraper. One man handles the entire operation through simple automatic controls. Operating range is easily extended. Sturdily built for long, low-cost service. Electric, gasoline, Diesel or steam power.

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in upper areas and that deeper development is therefore justified. Diamond drilling by Kearsage, Inc. during the latter part of 1945, directly under the famous Callahan Stope, is said to have shown continuation of the fissure system with strong mineralization, and in two areas, commercial ore which can be immediately developed.

The U. S. Bureau of Mines conducted considerable geological work and diamond drilling during 1946 in both the Mono and Kearsage properties. This work developed valuable geological information and is also said to have disclosed 5 feet of commercial ore 296 feet below the tunnel level.

Modern Tungsten Plant at Bishop

Bishop Concentrate & Cleaning Co., a new firm to process tungsten concentrate, has announced installation of a large magnetic separator at the firm's location in the old Bishop tungsten mill, seven miles south of Bishop, Calif.

Glenn E. Benweare is managing the company which has also installed complete roasting facilities for upgrading of tungsten concentrates, making the unit the most modern on the coast.

Tungsten producers in the area will benefit, it was pointed out, since the modern equipment will assure acceptance of their products regardless of original impurities. Complete sampling works and warehousing are provided at Bishop under management of the Bishop assay and engineering office.

Aspen Dumps to Be Milled

It is reported that large scale milling operations of the immense dumps of the old silver-lead-zinc mines in Aspen, Colo., will soon be under way. The report is to the effect that the Pacific Bridge Co. plans to put up a mill capable of treating 1,000 tons of this dump material each day. Humphreys spiral concentrators will be mill equipment.

Large areas of Aspen and Smuggler mountains are composed of low-grade ore that can be economically mined only by power equipment and moved by large trucks or carryalls. It may be possible that this ore may find its way into the proposed Aspen mill.

W. Clifford Dunham, geologist-engineer of the U. S. Bureau of Mines, Salt Lake City office, has been in Aspen to continue the sampling of the extensive mine dumps about Aspen, started last summer by the bureau.

Lease Signed on Utah Property

Horn Silver Mining Co. in the San Francisco district of Utah reports the signing of a new long-term lease with Metal Producers of Los Angeles, who have been operating the property the past three years. Government funds for exploration have been increased to $87,000. A new 500-ton daily capacity flotation mill has been purchased. Present royalties accruing to the Horn Silver are averaging $4 and better per ton. The long-term lease calls for the same terms as the old—15 per cent of net smelter return with $1 put into new development for each ton mined.

Getchell Operating Pilot Plant

The first unit of its enlarged cyanide mill in the Potosi district, eastern Humboldt county, Nev., has been started by the Getchell Mine Inc. The operation at present consists principally of pilot plant work and testing out the new flow-sheet, which shortens the mill process and will

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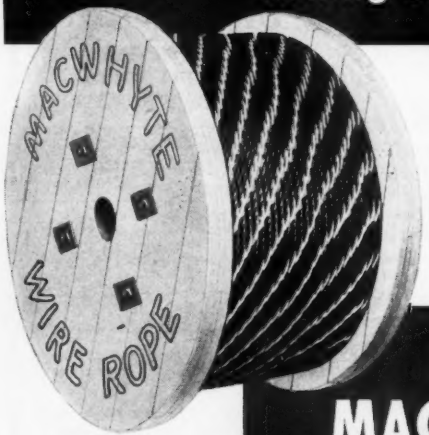

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effect important economies in treatment.

The pilot plant was designed for a basis of handling 100 tons of gold ore per day and upon completion of the preliminary milling tests the company management plans to add necessary equipment to the plant to enable it to mill around 1,500 tons of gold ore per day.

The Getchell company is operating its 500-ton tungsten concentrator, housed within the cyanide mill structure, on a custom basis, milling scheelite from the nearby Riley mine of the U. S. Vanadium Corporation.

Nevada Placer Progressing

Proceeding with plant installation and provision for water supply, the Eureka Hamburg Mining Co., with a large area of tested gold-bearing gravel deposits at Leonard Creek in northwestern Humboldt county, Nev., has awarded a contract to move 6,000 cubic yards of alluvial gravel to its newly-installed washing plant. Lauren S. Fish, president of the Eureka Hamburg Co., in Reno lately with Addison N. Clark, consulting engineer, said that a Denver-type spiral screen had been provided in connection with the trommel circuit, designed to break down some of the "tight" gravel and result in higher gold recovery.

Hall Named for Dean Roberts

The mines building on the lower campus of the University of Washington at Seattle will be named Roberts Hall, after the College of Mines dean, Milnor Roberts, a veteran educator and recognized authority on mining engineering.

Dean Roberts, a graduate of Stanford University, has been at his campus post since 1901.

Company to Operate on Old Montana Claims

The Princeton Mining Co. has been organized to equip, develop and operate the Princeton mines in accordance with recommendations made in a mining report on the property by Francis A. Hancock, consulting mining engineer of Missoula, Mont.

The property is in northern Granite county, five miles from Maxville, Mont., and consists of five patented lode mining claims, all owned outright by the company. The Princeton mining claims were patented in 1884, since which time high-grade shipments of silver-lead-zinc ores have been made. The ore showed promising milling possibilities.

WHETHER IT'S A SLEEK AUTO OR A HOLMES CAGE IT TAKES GOOD DESIGNING!

In HOLMES design all operating mechanisms have been simplified as far as possible, both to eliminate dead weight and reduce the percentage of delay from failure of some gadget to function properly. All operating parts are arranged for quick change with ordinary tools.

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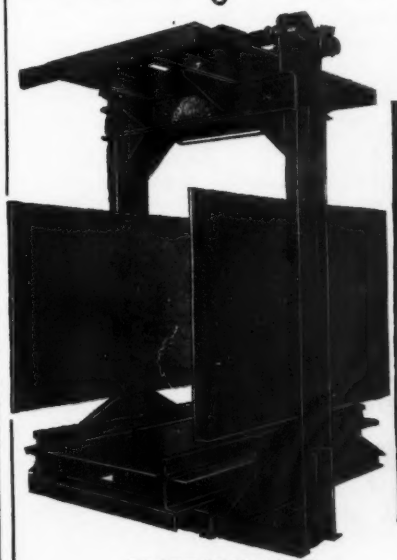

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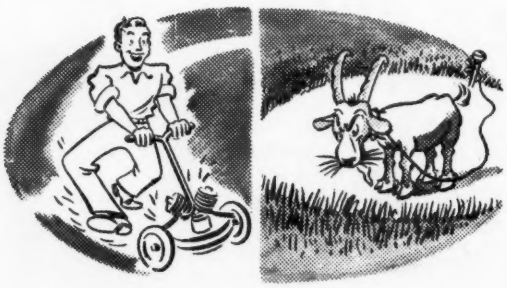

Nothing Can Quite Take Steel's Place AT ANYWHERE NEAR 3¢ PER LB.

Even to roundup a goat for lawn mowing purposes would cost more.

The Iron Age composite price* of finished steel is still less than 3¢ per lb.

Steel, which daily serves every household, farm and business a thousand and one ways, has advanced less than ⅓¢ per lb. in the last ten years.

This modest average increase applied to the cost of steel used in any product adds very little to its cost. For instance:

$0.09 more for 33 lbs. of Steel in a Lawn Mower.

$0.60 more for 200 lbs. of Steel in a Washing Machine.

$4.50 more for 1500 lbs. of Steel in a Farm Tractor.

$7.50 more for 2500 lbs. of Steel in a Motor Car.

$6.90 more for 2300 lbs. of Steel to fence a 40 Acre Field.

Obviously, the average increase in the price of steel affects the cost of living very little.

*Iron Age's composite price is a weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strip representing 78% of U. S. output.

Fabricated steel products such as grinding media, bolts, nuts, rivets, steel joists, wire mesh, forgings, etc. which must go through many finishing processes are higher per pound than the composite price of steel.

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SHEFFIELD STEEL

Sidney Mine a Steady Producer

Sidney Mining Company is now one of the large and steady producers of lead-zinc ores in the Coeur d'Alene district of Idaho. The company has paid its own development expenses, erected and paid for a modern flotation milling plant of 300-tons capacity, and as of June 1, had a balance in bank of $125,000, all from current ore shipments. Sidney is the largest mine in the Pine Creek area. It has a proven ore shoot over 1,000 feet long, averaging from tunnel width up to 15 feet, which averages a mill feet containing 14 per cent in combined lead and zinc minerals.

Idaho Phosphate Production

The San Francisco Chemical Company is now producing 60,000 tons of phosphate rock per month, or about 38 railroad cars per day from deposits at Montpelier, Idaho, according to D. L. King, resident manager. The J. R. Simplot Company announces that it is planning to launch a $5,000,000 project for the production of high grade phosphate fertilizer from beds in the Montpelier area. T. C. Cutler, Simplot's chief engineer, says the product will be made by electric furnace process from salvaged prosphate shales normally wasted in the production of superphosphate. The company estimates their production will be about 50,000 tons of 47 per cent phosphate fertilizer per year per furnace.

Tintic to Repair Main Shaft

The Tintic Gold Mining Co. at Mammoth, Utah, has let a contract to repair its main shaft to the 1,000 foot level in preparation for the development of a lead-silver ore body discovered several years ago when the price of lead did not warrant production. Early shipments are expected, according to E. E. Hoffman, president and general manager.

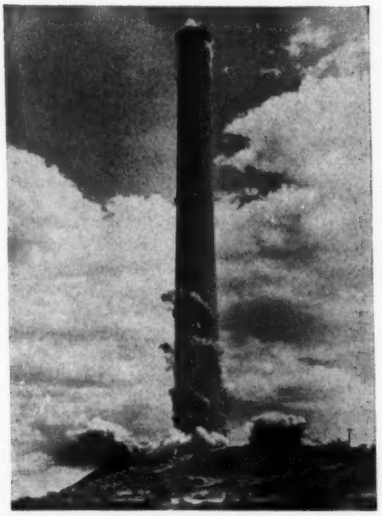
The Tintic Gold property is adjacent to the Grand Central, Mammoth and Centennial Eureka mines, all with records of production in years past.

Diatomite Plant Completed

The Eagle Picher Co. of Cincinnati is completing construction at Clark, Nev., 18 miles east of Reno, of a plant designed to process diatomite from a deposit seven miles distant, already stripped for production by power shovel. Plant capacity will be in excess of 700 cubic yards of raw material daily, or from seven tons an hour upward of finished products of a wide variety.

A Landmark Passes

One of the landmarks which has dominated the Verde Valley of Arizona for more than a quarter of a century passed into history on June 22 when the smelter smokestack of the United Verde Extension Mining Company was deliberately destroyed to make way for aviation progress. The 425-foot stack had not been in use since 1938 when the mining company discontinued mining operations at Jerome and dismantled the smelter at Clemenceau, but it stood just one-



half mile from the runway of the Clemenceau airport and had been a major obstacle to air traffic, particularly night flying.

The destruction of the stack was accomplished when more than 1,400 sticks of dynamite were exploded simultaneously. There was a low roar, an expanding cloud of gray dust, and the stack simply slid straight down to earth.

Dynamiting of the stack was directed by E. W. Fredell, chief electrician of the United Verde Branch, Phelps Dodge Corporation, and Fred Selberg, pit foreman for Phelps Dodge and an expert powderman. The actual work was done by a crew of eight men under the direction of Eddie Snyder of the Clemenceau airport.

In preparation for the blast 104 holes had been drilled three feet deep into the base of the walls, 515 pounds of dynamite had been placed in them, and 1,500 feet of copper cables laid to the nearest building to carry the 440-volt electric current to the charges.

The United Verde Extension Mining Company constructed its smelting plant at Clemenceau during 1917 and 1918, the smelter having gone on production in July 1918. The smokestack, of brick and concrete construction, was 425 feet high, 30 feet inside diameter, with walls that tapered from 3 feet 10 inches thick at the base to one foot at the top. It is estimated that 75 carloads of hollow brick and concrete went into its construction.

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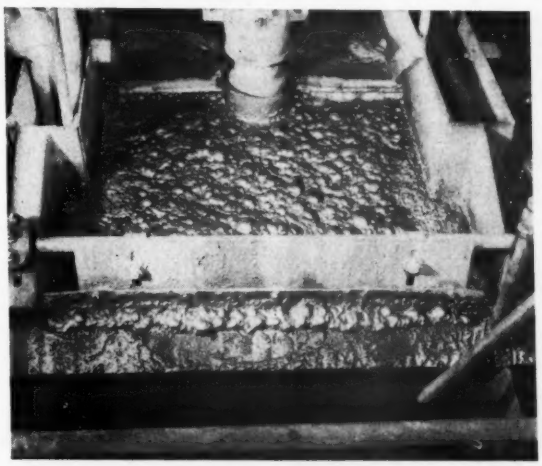

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Concentrated "Wet Water" Promotes Mine Health and Safety

The Compound M concentrated cartridge and automatic flow proportioner, which was recently perfected by the Johnson-March Corporation, consists of a highly concentrated solidified wetting compound combined in a cartridge or cylindrical form, 3½ in. in diameter and 8 in. long, and a compact proportioner, or dispenser, which connects into a water line itself. There are no pumps or motors, as the water pressure does the spraying. The solidified cartridge is designed to dissolve in proportion to the water that passes it, and each cartridge will treat approximately 1,000 gals. of water.

The automatic flow proportioner has a device that shuts off the unit completely if the operator forgets to put in a new cartridge when the old one is exhausted. The replacement of the cartridge is as easy as loading a shotgun. When the replacement is made, the automatic shut-off goes back into the neutral position and will not operate again until a replacement is required.

The automatic flow proportioner, which is only 4½ in. in diameter and 19 in. long, can be attached to any cutting or loading machine, rotary dump, or in the tipple. Four bolts or lag screws hold it in place. It is complete with control valve and pipe or hose fittings.

The concentrated "wet water" cartridges are packed 12 to a carton, having a total weight of less than 45 lbs.

The manufacturers of this automatic flow proportioner unit and concentrated, solidified "wet water" cartridge are so confident of their effective performance that they are selling them on a money-back guarantee. It is claimed that tests indicate these proven advantages:

1. To materially reduce (as much as 80 per cent) dust in the air and dust accumulations in air courses and passageways, thus lessening the explosion hazard.

2. To increase visibility of workers, thereby cutting down on accidents caused by inability to see.

3. To aid in preventing respiratory diseases, and thus decrease absenteeism and accidents caused by inexperienced substitutes.

4. To cut down on the use of water by approximately 75 per cent, and so aid preparation, lessen water attack on metal parts, and reduce possibility of coal freezing during cold weather.

5. To aid in increasing production through greater efficiency, safety, and health.

The cost of this new packaged dust-control process is repaid many times through increased efficiency and greater production.

The Compound M cartridge and automatic flow proportioner for producing "wet water" are just as effective for controlling dust in the metal as in coal mines. This same simplified method also has widespread application in foundries and industries where dust is a hazard or a nuisance.

Gardner-Denver Sells Governor Business

In the interest of centering manufacturing facilities on its principal lines, Gardner-Denver Co. has sold its governor business to the Wiebmer Machine Shop of Quincy, Ill., Gardner-Denver officials recently announced. Gardner-Denver will henceforth concentrate on its expanding business in rock drills, air compressors, pumps, and other allied products.

Governors have been a part of the Gardner-Denver line almost since the company's founding in 1859 by R. W. Gardner and his son, J. W. Gardner. The early activities of the company were confined to the manufacture of fly-ball governors for steam engines. With the passing of steam as the principal source of power, the company expanded into other lines; namely, air compressors, pumps, and rock drills.

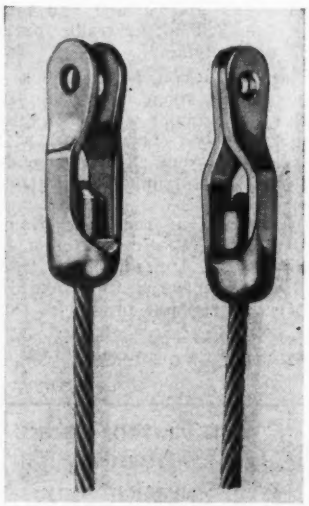
Gould Takes Over Philco Storage Battery Division

John Ballantyne, president of Philco Corporation, has announced that the Corporation's Storage Battery Division has been acquired and is to be operated by the National Battery Co. as a consolidation with its Gould Storage Battery Corporation for the manufacture and sale of industrial storage batteries. The Gould Co. will assume warranty and service responsibility for all Philco storage batteries now in use and will have the right to continue manufacture and sale of Philco storage batteries during the transition period.

MacWhyte Now Offers Socketype Cable Terminals

Macwhyte Co., wire rope manufacturers, Kenosha, Wis., are now making the "Socketype Cable Terminals" formerly made by Paulsen & Nardon, Inc., of Los Angeles.

These terminals consist of an alloy steel cadmium plated eye or fork type fitting, plus a stainless steel sleeve for swaging to cable (wire rope). They are available loose or attached to the rope in a complete cable assembly to specification length.



New specification literature No. 47-46 is available by writing to Macwhyte Co., Kenosha, Wis., branches, or distributors.

Rubber-frame Safety Goggle

A new rubber-frame safety goggle, specially designed for work in hot and humid atmospheres where chemical and dust hazards exist, is announced by American Optical Co., Southbridge, Mass.

Feature of the new 705 super-vent goggle is a nosepiece with an inhalation and exhalation valve to prevent fogging and steaming of the goggle's large acetate single lens. When the wearer inhales, air sweeps through the chamber, removing moisture on the inner lens surface before it can

fog. When exhaling, the inlet valve closes, allowing moist air to escape through exhalation valve. The frame is molded from natural rubber and conforms to the contours of the face, giving an airtight fit to prevent any acid or dust leakage.

The goggle is recommended for wear on jobs requiring the handling of acids and caustics. It protects against chemical splashes, spray and impact of foreign particles and exposures to fine dust concentrations.

Beckley Machine and All-State Equipment Merge

Beckley Machine and Electric Co. has announced the purchase of the entire capital stock of the All-State Equipment Co. of Logan, W. Va., and the merger of the two companies on July 1, 1947, under the new name of the National Mine Service Co., Bemeco Division at Beckley, W. Va., All-State Division at Logan, W. Va.

The officers of the new company remain the same: Gordon MacVean, president; R. H. Magee, vice president; E. J. Nicholls, secretary.

As soon as possible, warehouse stocks similar to those now carried at the Bemeco Division will be available at the All-State Division, where additional adjacent facilities have been acquired. Sizable quantities of Joy repair parts will be carried at both locations for prompt truck delivery to mines.

The merger puts the organization in an improved position for handling armature and field coil rewinding, rebuilding of mine locomotives, mining machines, and to commence a program of rebuilding Joy loading machines and shuttle cars, as well as Sullivan mining machines.

SKF to Spend Four Million on Expansion

SKF Industries, Inc., Philadelphia, Pa., announces a two-year modernization and expansion program that will find the ball and roller bearing firm spending more than $4,000,000 to equip its two Philadelphia plants with new machinery capable in some instances of operating from two to six times faster than standardized equipment long used in the anti-friction bearing industry.

While the bulk of the expenditures will go for new machinery required in the production of anti-friction bearings, the program, according to Thos. W. Dinlocker, vice president, is aimed primarily at stepping up production of spherical roller bearings.

"The company believes this new program will enable us to increase output still further so as to speed deliveries to customers, maintain high ratios of employment, and improve manufacturing efficiency," he said.

Some of the new machinery already has been installed, still more is being designed and built in cooperation with machine-tool builders, and certain types of new equipment required in exclusive SKF processes are being built in the firm's own machine shops, Dinlocker said.

ALCOA Introduces Industrial Roofing

Production of a new, high-quality aluminum roofing material for industrial use, to be called Alcoa Industrial Roofing, was announced recently to the building trades by Aluminum Co. of America.

The new product is a lightweight, heavy-duty specially formed material, developed by Alcoa research to meet the demand of industrial builders for an aluminum roofing and siding specifically adapted to factories, warehouses, storage depots, hangars, and similar structures. Alcoa states that the new industrial roofing will carry heavy loads and meet the exacting requirements of building codes.

Made from a special aluminum alloy, the new material will be an industrial running mate for the standard Alcoa roofing sheet, which is already in use throughout the nation. Combining high strength with high resistance to industrial atmospheres, minimum maintenance and reduced roof load, this roofing will have a covering width of 32 in., allowing for a side lap of 1½ corrugations. It will come in standard 5-ft. through 12-ft. lengths, .032 in. thick.

Alcoa also announced that industrial aluminum siding, of the same alloy and length as the roofing, is going into production at the same time. The siding will have a coverage of 32 in., and will meet code requirements for siding materials.

It was stated that Alcoa Industrial Roofing and Siding will be offered for sale through normal channels of distribution. All necessary fittings and accessories, such as ridge roll, flashings, rivets, nails, straps, etc., will be supplied with roofing and siding.

Much of the current popularity of aluminum roofing for industrial and farm buildings has stemmed from the successful records established by this material in Army and Navy construction during the war.

— *Announcements* —

It has been announced that **W. S. McAleer**, of Pittsburgh, Pa., has been elected vice president of the **McNally Pittsburg Mfg. Corp.**, Pittsburg, Kans., effective July 1. He will maintain headquarters in the Pennsylvania city, as manager of the eastern district of the company.

Mr. McAleer joined the company in 1941 as manager of the Pittsburgh, Pa., office. He graduated from Carnegie Institute of Technology and has been associated with the coal and coke industry for the past 25 years.

* * *

Appointment of **Portable Service Equipment Co.**, 3529 North Front Street, Philadelphia, Pa., as distributor of Davey industrial compressors is announced by **Davey Compressor Co.**, Kent, Ohio.

The new distributor will handle the entire Davey industrial line of departmental units of 60 to 315 c.f.m. capacities. Territory to be covered includes the city of Philadelphia and counties of Philadelphia, Chester, Montgomery, and Bucks.

* * *

A. E. Chapin, who has been in charge of the Washington office of Western Machinery Co. and Western-Knapp Engineering Co. since 1942, reports that he is no longer connected with these companies. He has been placed in charge of the Industrial Equipment Division of the **Export Engineering Co.**, specializing in buying machinery and equipment for foreign accounts. Offices will remain at the same location in the Colorado Building, Washington, D. C.

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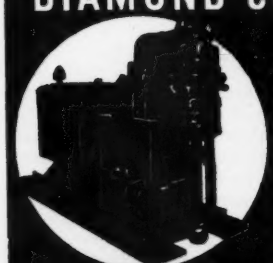

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The Freeman Coal Mining Corporation demonstrates the great American faculty for Vision in its new All-Stoker Coal Preparation Plant at Herrin, Illinois . . . planning for the future in coal preparation. To take advantage of the market trend toward stoker sizes, the Freeman Corporation will utilize equipment designed to give maximum efficiency and the greatest flexibility in fulfilling the requirements of this market. For this plant Roberts and Schaefer engineers have perfected the designs which make it possible to produce the largest quantity of profitable coal sizes blended for the exacting demands of the entire field of consumers.

The details are vitally interesting to other men of Vision and will be furnished gladly by the Roberts and Schaefer Company.

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